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THE SCOTTISH GEOGRAPHICAL MAGAZINE

Roberts, F.M.

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THE SCOTTISH GEOGRAPHICAL MAGAZINE

PUBLISHED BY THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY
PROFESSOR JAMES GEIKIE, LL.D., D.C.L., F.R.S., HON. EDITOR
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VOLUME IX : 1893

EDINBURGH
PRINTED BY T. AND A. CONSTABLE, PRINTERS TO HER MAJESTY
AT THE UNIVERSITY PRESS
1893

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THE SCOTTISH

GEOGRAPHICAL

MAGAZINE.

A RIDE THROUGH PERSIA.

By Lieut. D. S. Buist,

2nd Lancers, Hyderabad Contingent.

(*Read at Meetings of the Society, in Edinburgh and Glasgow, December* 1892.)

Persia, as every schoolboy knows, consists for the most part of a lofty tableland, lying from 3000 to 4000 feet above the level of the sea, and shut off from the coast-line by high mountain chains. To reach the interior, wild and mountainous districts have to be crossed; and the passes leading over the hills traverse some of the grandest mountain scenery in the world.

From Bushire, where the great highway of Southern Persia starts, to Shiraz, the first of the great cities, the distance is about 120 miles, and the track winds almost entirely amidst the solitudes of the mountains. Here and there, however, are verdant oases, remarkable alike for their beauty and fertility, where grain and fruit-trees of all kinds flourish in profusion.

The usual method of travelling from the Gulf to Shiraz is by caravan; but caravaning in Persia is not quite what we should imply by the use of that term in this country. There it consists, not in the use of a wheeled carriage of any sort, but of a string of transport animals. Men, with heavy saddle-bags behind them, bestride mules, whilst women sit in what seems anything but a comfortable position, jammed into square wooden boxes, from which rise light frameworks covered over with tightly stretched canvas. On each side of the mule is hung one of these queer-looking arrangements, and in each box reclines a woman, sometimes with one infant, sometimes with more, whilst in others three or four children are huddled together. It says much for the hardihood of the Persian mule, that, loaded as he is, and traversing such roads, he is able to accomplish the usual daily stage of from ten to twelve miles.

All travellers are armed, and it is very unusual to meet with solitary wayfarers. The Persians fully believe in our maxim that "there 's safety

in numbers," and when they wish to pass from one part of the country to another they usually join a caravan, or party of travellers.

My own caravan from Bushire to Shiraz consisted of three mules, and the only little adventure I had in my ride of 1000 miles took place at the summit of one of the wildest and loneliest rocky ladders that lead to the interior. Here I was accosted by five men, clothed in picturesque rags, each carrying a long knife in his waist-belt, and a long thin muzzle-loading gun slung over his shoulder. They kept following me for about five minutes, demanding backsheesh for performing the duties, as they said, of road-guards. It was still light, and a more villainous-looking set of fellows I have never yet seen. I told them to clear out of my way, but this they did not at all feel disposed to do. On one of them at last laying hold of my bridle, I gave him a smart crack over the knuckles with a riding-crop I happened to have in my hand. This caused him to relinquish his grasp, but all immediately closed upon me, and as a last resort I drew my revolver from my wallet. This produced the desired effect, for they now fell to the rear, and remained together as if in consultation as to their future movements. I pushed on, and was not again disturbed by the unpleasant attention of such dangerous-looking vagabonds.

Next day, whilst crossing the highest of the mountain passes, we found ourselves in a region of snow-crowned hills, and thenceforward to the confines of the Caspian we were never out of sight of white-crested peaks. One is never far from the hills, for Persia is a land of mountains and plains. One vast plain succeeds another, hemmed in on all sides by the everlasting hills, which bound the distant horizon, where mountain rises upon mountain.

Two days later we were gladdened by the sight of many wayfarers and numerous caravans, betokening our approach to a large city. We passed through a long but somewhat narrow plain shut in by hills on all sides. The soil was rich, and the supply of water being abundant, green corn-fields stretched as far as the eye could reach, and clung to the lower slopes of the mountains. Orange and pomegranate trees too flourished in profusion, and the creeping vine was everywhere conspicuous. Soon, in the distance, the domes and minarets of far-famed Shiraz arose before us from among many groves of trees. But how grievously were we disappointed with the city when, in due time, we reached it! Within its walls the sights are few and unimportant; and for interest the city has only the beauty of its surroundings and its classic associations to fall back upon. These still linger around it, for even to this day a vestige of its early reputation for letters is preserved, in that the dialect of its inhabitants is generally looked upon as superior to that of any other provincial city, if not of the capital itself; and the same measure of praise applies also to the caligraphy of the Shirazis, for in Persia handwriting is much studied—indeed, it is considered quite a fine art.

But, however shrunken from its former estate the city may be, the vast plain on which it stands has lost nothing of its pristine loveliness.

"But beauty still is here,
States fall, arts fade, but nature doth not die."

Though no broad river sweeps throughout its length, numerous small water-courses convert it into one of the most fertile oases in Persia. The numerous buildings of the wealthier inhabitants in the environs of the city, the many gardens dotted over it, and the fine clumps of trees growing everywhere in profusion, tend, with its luxuriant fertility, to make of this plain a landscape of smiling plenty, not to be equalled in all Persia.

In one of the gardens sleeps the shade of Hafis, in another rest the remains of Saadi. Both repose in the shadow of the hills, both slumber beneath the murmur of whispering leaves: one lies in a verdant garden by which the road winds to the capital; the other, far removed from the hum of the old city, sleeps amidst groves of weeping cypresses. Both are held in high esteem by the Persians of to-day, and to both shrines pilgrims repair from far-distant provinces. To me their graves remained unseen; it is only the gardens that enshrine them that I know. My host asked me not to enter these famous garden tombs, for on the last occasion they had been visited by a European an unfortunate *fracas* had taken place. Since then the ill-feeling towards the Feringhi had been aggravated by the unfortunate tobacco concession, and my host deemed it advisable that I should not enter the hallowed enclosures.

Almost the only industry for which Shiraz is now famous is its manufacture of wine. Although the use of alcohol is forbidden by the Koran, the inhabitants of this somewhat fanatical city have earned the reputation of being some of the best wine-makers in Persia. This manufacture is carried on chiefly by Armenians and Jews, from grapes grown in the immediate vicinity of the city; and the wine, besides having a considerable local sale, is exported in large quantities to the capital, where it is in high favour with Persian connoisseurs.

In Shiraz I learned from experience two facts about the customs of the country: one is, that numerous days are observed as saints' days, which entails on the inhabitants an entire cessation from business; the other, that there is a weekly post to Teheran, which clears the post-houses of all their horses. The day I arrived I sent my saddle-bags to the bazaar to have them bound with leather; next day, being a saint's day, I was unable to recover them; and, to add to my discomfiture, it was also a mail-day, and there was not an animal of any kind in the post-house. The postmaster, however, promised me horses in the afternoon, but it was not till 6 P.M. that they turned up at my door.

From time immemorial there has existed along the great lines of communication in Persia a system of postal stages. Stretching from Shiraz to the confines of the Caspian are *chapar-khanehs*, or post-houses, from twenty to twenty-five miles apart. At each stage from six to eight horses are kept; and if not required by the post, a traveller can engage these for conveying himself, his servants and baggage, to the following stage, at a charge of one *keran* for each horse per *farsakh, i.e.* four miles. A *shagird*, or post-boy, accompanies the traveller to take the horses back; he is also of use in acting as guide, for without such assistance I should have found it utterly impossible to reach the capital. In many places tracks converge, while in others they entirely disappear.

Having overcome my little difficulties, I once more set out on my journey northwards. I rode one horse myself, my servant a second, and the postboy was mounted on a third. My kit, packed in two pairs of saddle-bags, hung down across the flanks of my attendants' horses. Though heavy and somewhat awkwardly placed over their quarters, the load did not appear to interfere at all with their action. But on the first stage our rate of progression was slow, for the road still lay entirely among the mountains. The night too was dark, and it took us from six to eleven o'clock to cover a distance of twenty-one miles. Next morning, as we pushed onward over the wide plain of Merv-dasht, we were able to make out rows of tall stately pillars to our right front, standing out against the dark background of the Kuh-i-Rahmet hills. Gradually they became more distinct, but until we got quite close to them they seemed to stand alone against the brown hillside. It was only when we arrived beneath the artificial terrace from which the mighty ruins of Persepolis rise that we were able to appreciate their magnitude.

"Besides the colossal winged human-headed bulls which flank the propylæ of Xerxes there are," remarks a recent writer in the *Times*, "remains of no less than six buildings upon the platform. The edifices and the stairways leading to them were richly decorated with sculptured reliefs, carved from a rich blue limestone; and herein lies the feature that distinguishes Persepolis from Susa. Whereas at the latter city the decoration seems to have consisted mainly in enamelled brickwork, at Persepolis we have, in a material which, for beauty and variety of surface and durability of character, almost vies with the finest marble, the principal relics of the Achæmenid arts of sculpture and architecture."

In ancient Persia the office of king had a semi-sacerdotal character, and the ruins that still remain all stand on the artificial terrace, and must have comprised the royal stronghold, palace, and temple only: of the city itself not a vestige is to be seen. The platform is faced with gigantic blocks of stone, and stands out at right angles to the steep hillside. A broad flight of shallow steps leads up to it, and on it stand rows of pillars, from the bull-crowned capitals of which the double heads of the once sacred animals look forth in opposite directions. Standing around are mighty ruins, that one would imagine only machinery could have piled up. The staircases embellished with bas-reliefs, that rival those of Grecian art, the bull-flanked portals of the mighty temples, and the massive remains of the hundred-pillared audience-chamber of the great king, are fragments which I shall never be able to forget. High up on the hillsides, looking down upon the plain, are visible the rock-cut temples, or tombs of the kings. These are large chambers, hollowed out of the solid rock, which has been scarped back deep into the hillside, to form a level platform in front of the portals of the sepulchral temples.

Amongst the ruins of Persepolis I came upon an Englishman, who had been sent thither by the authorities of the British Museum to take mouldings of the more important sculptures. He had already filled some five or six cases, and was still hard at work when I met him. But he kindly offered to go over the ruins with me, and show me some underground passages in which he took an especial interest. We

followed up one or two of those subterranean alleys, which all ended abruptly in the solid rock; but they did not interest me sufficiently to induce me to continue my explorations, more especially as my time was limited.

Just as we were about to descend the broad staircase leading to the plain, preparatory to taking our departure, an excited Persian accosted us, and besought us to enter his house and cure some relative who lay nigh unto death. It was with the greatest difficulty we got him to believe that we possessed no medical skill; he still hung on our footsteps, and it was only when we had actually departed that he went away sorrowing. My acquaintance told me it was often thus. The natives, hearing that there is a European at Persepolis, conclude he is a physician, and bring to him from great distances the halt, the lame, and the blind, in the vain hope that, touching the hem of his garment, they may be healed.

After leaving Persepolis, our road lay through a typical Persian country—a flat plain surrounded by bleak and treeless hills—till we reached Kawamabad, where there is a fine new caravansera. Although it had been but recently built, it required a few minor repairs, which in all probability it will never get. This apathy of the Government in keeping up buildings which private philanthropy has founded for the benefit of the community is much to be regretted. Bridges are undermined by rivers, roads are swept away by floods, and causeways subside below the level of the marsh, while the local governor exacts the uttermost farthing in revenue from an oppressed but withal contented people.

Next day these thoughts passed through my mind, as, plodding along a miry track at a slow pace, I had plenty of time for reflection. At last we got on to firmer ground, and a good gallop dispelled our gloomy meditations. We pulled up on the banks of a small stream which wound its way through the hills in a pretty defile. On emerging, we were again able to quicken our pace. By the roadside rose an old ruin, said to be the tomb of Cyrus; farther off to the right a slender pillar stood out conspicuously, but we had not time to explore the ruins that surround it. On reaching Murghab we changed horses and set out on a rough and rocky path leading over low hills. A slight shower of rain began to fall, and the rumbling of distant thunder seemed to portend a storm. Just then three men met us, armed with the usual long thin muzzle-loading gun, and offered themselves as escort over the wild hilly country. We politely declined their offer, but they still followed us, telling us of the dangers of the road, and their own deeds of daring. They forced their unpleasant company on us for the next half-hour, but at last fell to the rear, and we soon lost sight of them on the winding road.

We were now nearing Dehbid, a village situated on a bleak wild plain to the west of the central tableland of Persia. A keen biting wind sweeping across the plain chilled me to the bone. Darkness, too, was fast approaching, and the tired horses could not be forced out of a walk. It was long ere we could descry the telegraph-office, almost hidden in a clump of reedy-looking trees, and still longer ere we reached

it, for our rate of progression became slower and slower. It is curious to note, when travelling over the barren plains of Persia, how objects in reality far away appear quite close. Again and again have I found it so, but never did I wish the long way shorter with greater fervour than I did that day.

When we at last drew up in front of the telegraph-office, the official in charge afforded us a most hearty welcome. He was a Scotsman who had lived long in Persia, and knew much of the country and its people. He told me the new Governor of Shiraz was expected to pass through the village in a day or two on his way to the provincial capital, and pointed out to me a company of about 100 soldiers, who had come from the city to form his escort. On hearing of their approach, he said, most of the villagers had fled, concealing the greater part of their household possessions, but leaving the most valuable of them in his custody. Whatever the soldiers could lay hands on in the village they seized, and the few peasants who remained had come to him in a body, telling him of their grievances, and imploring the mysterious protection of the telegraph wire.

Hoards of wandering Iliats, or Gypsies, had already begun to arrive in the district. These wanderers are said to number no less than a fifth of the population of the country, and, dotted over the bare landscape, their black tents stood prominently out. With the advance of summer they arrive in increasing numbers, causing almost as great consternation to the villagers as does the approach of the soldiers. With the advent of winter these nomads betake themselves to the low-lying plains, for the elevation of Dehbid is about 8000 feet above the sea, and the wind sweeps across the snow-covered plateau with such fury as to render an out-door existence quite impossible. Even in the month of April I found the cold so severe that I had to get a fire lit in my room, and next morning, on the road, a cold biting blast blowing across the moorland so numbed my hands that I could hardly hold my bridle reins. Descending through a deep and narrow defile, we got a little shelter, and, the sun getting up, we began to feel warmer. We now entered upon a vast plain, dominated almost throughout its length by a lofty snow-covered mountain. The views of its white peak obtained from different points, and in different lights, modifies to a small extent the monotony of the desert.

Towards evening signs of considerable cultivation began to appear, and later, amidst a green oasis, we saw the dry mud walls of Abadeh rise before us.

To a European the exterior of Persian towns is disappointing. Bleak dismal-looking mud walls succeed each other, and one passes from street to street in the vain hope that at the next corner some pleasing prospect may open out to view, but only to find the long black line of wall continued round the next bend. Let us, however, enter one of the numerous small gateways that open from the monotonous street, and mark the wonderful transformation. Before us, clothed in fresh green, lies a beautiful garden, studded with clumps of trees, where, through breaks in the foliage, we are just able to make out the pleasing

façade of the house of our host. In the centre of the garden glimmers a small rectangular tank, with sides so perfectly levelled that a gentle splash of water overtops the curb-stone, and, overflowing on all sides, seems to lend an air of coolness to the hottest day. A little jet of water shoots upwards from the centre of the miniature lake, and the spray falling gracefully downwards is blown hither and thither by puffs of wind. Fish of many kinds disport themselves in the clear water, and birds of various species congregate round this pool of water in a thirsty land. Inside, the rustling of the leaves, the falling of the water, the chirrup of the birds, and the verdure of the garden, contrast forcibly with the arid bareness of the bleak exterior.

I had been invited by the telegraph official at Abadeh to put up with him. Circumstances had forced on him a knowledge of medicine, and what he knew he had learned practically, though he had acquired a little from books. During the short time I stayed with him he performed one or two minor operations, dispensed a few medicines, and visited one or two sick persons. Though in this country he might be called a quack, in Persia such knowledge as he possesses is of the greatest benefit to the people, and such services as his, given freely and without price, tend to establish a lasting bond of fellowship between Feringhi and Moslem.

Next morning, he asked me if I should like to see his pets, and after closing all the doors of his courtyard he entered a side passage, and immediately after out sprang two large female panthers. He told me he had bought them as cubs some five years ago from a native huntsman, and since then they had been familiar friends to him. In great bounds they leaped about the yard, chasing each other, and anon returning to be caressed and fed by their owner, who stroked and brushed their glossy coats, and finally led them back to their den, an operation they submitted to most cheerfully. The pleasure of watching their gambols was not, it struck me, without a considerable spice of danger.

Horses were not procurable till next evening, when three dejected-looking brutes were brought round to the door. It was already six o'clock, and, making up our minds for a dreary, dismal ride, we set out. Darkness soon set in, and with it arose an icy wind that blew straight off the snowy ridges surrounding the plain. The horses could only move at a walk. An attempt at a faster pace had already deprived the beast on which my servant was mounted of much of the skin that ought to have covered his knees. But the longest lane has a turning, and the dreariest Persian stage an end, and moving slowly onward we at length reached the post-house of Shulgistan. Here we slept, and next day at dawn resumed our march. The same plain stretched before us, the same desert extended on every side, and situated in the midst of it lay our destination, Yezd-i-Khast, one of the most curious and picturesquely dirty villages in Persia. As we approached, we saw it standing out in muddy blackness on the treeless waste, but not until we were close upon it did we make out the peculiarity of its position. It was only when coming upon a sunken river-bed, and descending into its channel, that we found a second valley which opened to our right. Perched high on the banks,

at the acute angle formed by the meeting of the waters, loomed in front of us this fortress-looking pile. At its base the natural rock was alone visible, and then upward and upward was wall upon wall, which finally culminated in the village. Here and there were holes in the walls, meant to serve as combined chimneys, windows, and rubbish-bins, for from the external appearance of the place it was evident that the conservancy arrangements were extremely primitive, and that anything wanted to be got rid of was thrown out of these openings, where it was left either to the force of gravity to carry it downwards, or to the power of the wind to drive it into any of the numerous crevices and irregularities with which the hill was covered. Jutting out from the walls, and scattered over their whole surface, were numerous wooden verandahs, so rickety and shaky in appearance that they seemed to threaten every moment to fall down. Towering over the acute angle formed by the junction of the steep valleys, this curious-looking mud heap commanded the valley lying almost 300 feet below.

The main valley is narrow but extremely fertile, and, at the time I passed by, it was green with corn-fields. The steep banks protect the crops from the fierce winds that devastate the plains, but they also tend to conceal its verdant freshness, which only becomes apparent when one has arrived right on the cañon-like banks of the river.

Leaving this quaint old place, we continued our march over the desolate country which surrounds it. At the next stage, however, we were fortunate enough to procure good horses, and, galloping across the plain, we reached Kum-i-Shah that evening. The postmaster of this place had the Western idea of punctuality, for at six o'clock next morning we were able to mount and proceed on our journey. The city was already astir, troops of horsemen were riding out of it, a crowd on foot was flocking out of the Ispahan gate, where beggars had already taken possession of the portals, and were loud in their application for alms. Pushing our way through this motley assembly, after considerable delay we reached the open road. Already the vanguard of some large caravan had arrived, for tents had been pitched and horses picketed just outside the city walls. As we advanced, the stream grew in volume; horses, ponies, mules, and asses continued to meet us. Now comes a victoria, now a brougham, then appears a phaeton; now it is a string of horses, each carrying only the smoking apparatus of its owner. As the caravan grows denser we hear in the distance the braying of trumpets and the beat of drums; soon we discern an opening in the crowd, along which moves at a slow pace a brougham drawn by six handsome little horses. On the box sits the coachman, and at the heads of each pair of horses marches their attendant, resplendent in official attire. In front of, and alongside, the carriage ride a few horsemen who perform the duties of escort, and allow no one to approach near H.H. the new Governor of Shiraz,—for it is he who is proceeding in state to that ancient city, to take up the duties to which he has been recently appointed. A mob of about one hundred persons, mostly mounted, bring up the rear, but behind them a long line of transport still continues to drag its weary length along the road.

As I passed by, the Governor noticed me, and sent a mounted retainer

to inquire who I was, and whither I was going, and also to express H. H.'s hope that I had had all my wants supplied, and that my journey onward might be a prosperous one. I thanked the Prince for his solicitude, and informed him that I had had a very pleasant time of it in his province.

The Governor, a younger brother of the Shah, had experienced his full share of the vicissitudes of fortune. Until lately he had been an exile at Bagdad, but the king, having relented towards him, had summoned him to his capital, had loaded him with honours, and now appointed him his satrap in far-famed Shiraz.

A long and rough road led up the sides of the great hill of Kuh-i-Suffa, but, on reaching the crest of the ridge, we were rewarded with a glorious view of the ancient capital, which lay embosomed in trees at our feet. The old city presented a fair sight lit up by the misty rays of a setting sun. Its score of domes, with their beautiful tiles, seemed to flash a right royal welcome to us, and the fair winding stream at our feet lay in the tender embrace of a valley that smilingly invited us to come and pitch our tents therein. Gladly we descended, and were soon wending our way through a perfect maze of tree-shaded alleys in the Armenian suburb of Julfa. The consul had kindly invited me to put up with him during my stay, and, with tennis, dinners, and a picnic, I spent some pleasant days in Ispahan. There were at that time some fifteen Europeans in the place, and life in the old city, as at Bushire and Shiraz, was cast very much on Indian lines.

Like most Persian cities, the greater part of the town is made up of ruins, some grand in their decay, others vestiges only of what they have been—symbols, indeed, of a tottering empire. Times are changed, and, as the seat of a merely local governor, Ispahan has sunk to the level of an ordinary provincial city. The Shah's eldest son, the Zil-i-Sultan, still maintains a tawdry state in the dilapidated palace of the Forty Pillars; the great dome of the Madresseh, or college, still stands, bereft of many of its exquisite tiles; the vast cupola of the king's mosque still looks down upon the royal square; the splendid thirty-three-arched bridge still spans the Zendeh Rud; and the smaller bridge still struggles bravely against neglect; but the palace on the banks, where the great Shah Abbas died, is succumbing more readily to nature. Ichabod, how the glory is departed!—a city that was then proud of its 650,000 inhabitants can to-day boast of but 80,000.

The Armenian suburb owes its origin to the great Shah Abbas, of glorious memory, who, in 1603, desirous that his capital should become a large trading centre, arbitrarily removed the entire population of an Armenian township from the banks of the Araxes, some 800 miles away, and settled them down at the entrance to his own capital, in a new city which he called Julfa, after their old home.

Here they began to increase and flourish, till a king came who knew them not. From a city of 40,000 people Julfa has decayed to a village of 3000. Now-a-days, however, it shows signs of resuscitation, and Dr. Bruce, who has lived and worked here for twenty years, told me that, though its sons go forth to the uttermost parts of the earth, they seldom

forget their country or their people, and many of them return, like ourselves after our life's work is done, to die at home.

Besides the C.M.S. schools, there is one supported and managed entirely by Armenians. I paid it a visit, and talked in English to more than one of its scholars. This school, like the churches, is supported to a large extent by contributions received from those of the ancient race who are residing abroad, and who in this way evince their desire for the advancement of their oppressed nation.

After a stay of three very pleasant days, we left Ispahan one cool afternoon, meaning to ride only some twenty miles before evening. The weather was delightful, and the ride to Murcheh Khurt, along a good and level road, proved most enjoyable. We reached our destination earlier than we expected; but as the next stage was one of the longest on the route, we did not alter our original intention, but stopped there the night. Throughout our day's march long lines of shafts, a particularly striking feature in Persian landscape, had ever been visible. These shafts mark the courses of *kanats*, or artificial underground streams, and it is upon this system that the little irrigation practised in Persia is conducted. The spring is found on a hill slope, where the first well is sunk; from forty to fifty yards distant other wells are dug, and these are connected with each other by a tunnel, the excavated earth being drawn up and placed round the openings in circular mounds. In this way water is, by degrees, led to the surface, and then distributed to the cultivators by numerous channels above ground.

From Murcheh Khurt to Kashan there are two routes: the more direct traverses the Kuhrud pass, where it rises to an elevation of 7000 feet; the other, more circuitous, has now become the post-road, as it possesses the advantage of remaining open for traffic throughout the year, while the former is constantly blocked by snow during the winter months.

It was along the post-road, of course, that my march lay, and for the next two days we traversed long dreary plains with small patches of cultivation scattered over them at long intervals; but notwithstanding the general barren appearance of the land, it is apparent that cultivated soil, wherever it is supplied with water, is extremely fertile. Although in so large a country as Persia the deficiency of rivers is remarkable, what strikes the traveller is not so much the absence of water itself as the absence of the means of storing and distributing it. Streams are allowed to lose themselves in marshes; the dissolving snow gives birth to hundreds of rivulets, the waters of which might be diverted by canals to many villages. But the inhabitants are too poor to bear the cost of doing this themselves, and the Government remains apathetic. One is never far from hills in this strange land, and it requires but a dam to be thrown across a valley, to convert many a bleak desert into a verdant garden. But little is done. The country is in a state of expectancy; it awaits either England or Russia to usher in the great awakening.

Undisturbed desert sweeps right up to the gates of Kashan, and then gives place only to the more dreary sight of acres of mud ruins. But we eventually reached the post-house, where we dismounted under a handsome stone-faced entrance. Whilst the tired horses were being un-

loaded, I went to have a look at the old city. As usual, I found it devoid of interest, but, I was told, it is still famous for its silks and brass-work. There is an entire absence of trees around the village, and indeed the same may be said of the whole country lying between Shiraz and Teheran, if the valley of the Zendeh Rud be excepted. The houses are almost entirely built of hard-baked mud, and their roofs are generally dome-shaped, so as to avoid the necessity of cross-beams of timber, for in Central Persia wood is scarce.

On the further side of the city there is a good deal of cultivation, but it disappears long before we come to the village of Sin-Sin, which is situated at the extremity of a small salt-marsh. The ground round about is so impregnated with salt that it presents a whitish appearance, and is, of course, absolutely unproductive.

At Sin-Sin we stopped the night, and next morning we started by making a long ascent. Our road thereafter threaded its way amongst hills, and later emerged on to the usual long and dreary plain. As we were scampering over the level ground, we were surprised to come upon a café, placed in an old mud ruin, almost in the centre of the plain, and far removed from any village. The proprietor came forward, and asked if we should like a cup of tea. I declined, but this was more than my servants could do, for, to a Persian, tea is much more than even whisky is supposed to be to a Scotsman. Few Persians travel without the utensils necessary to prepare their national beverage, and a *samovar* is to be found in every post-house. The tea is drunk from small glasses, holding perhaps a little more than our sherry glasses. It is highly flavoured with sugar, as many as two lumps being put into one glass, and is drunk without milk. The leaf is that of China, and throughout the northern and central provinces sugar has practically become a Russian monopoly.

Pushing onward over the plain, we soon came in sight of the gilded dome of the tomb of Fatima, flashing in the rays of a brilliant sun. Once again was I impressed with the deceptiveness of distance, for a full hour elapsed before we reached it. The rarefied atmosphere, the sharp outlines of the high hills, and the flatness of the plains, combine to deceive one in this respect. A plain that looks five miles broad may prove to be ten, while it is at all times hard to gauge its length, for as one advances new prospects keep constantly presenting themselves, the hills seem to shut in the ground over which one has just passed, and points that were conspicuous a short time ago can no longer be discerned.

As we near Kum we notice that there is much more cultivation round about it than there usually is near Persian towns, and the holy city strikes us as being of considerable mercantile importance, apart from its sacred associations. Such indeed is the case, for, as in other countries, religion and trade go hand in hand, holy-days become holidays, and religious feasts become commercial gatherings.

As we enter the city scores of storks watch our progress from the more elevated among many ruins, and, although we pass right under their quaint homes, they continue to stare at us quite unmoved. It is evident that they are regarded as sacred by the inhabitants, and are viewed with a

certain amount of awe even by the children. But the glory of Kum is the tomb of Fatima, the dome of which, covered with plates of beaten gold, is visible on all sides from great distances. Hither repair many caravans of corpses; for to be interred near the canonised Fatima is to ensure an entrance into Paradise. The method of conveying the dead hither is usually by caravans, which may consist of from five to ten mules. As we passed through the city, crossed the bridge, and got on to the new road which connects this place with Teheran, we passed one of these caravans. Evidently a few relatives of the deceased were accompanying him to his last resting-place; but such, I was assured, is not always the case, for demand creates supply, and for some time, in the larger cities, there have been contractors, who for a consideration engage to personally conduct, without the aid of relatives, the bodies of true believers to this famous *campo santo*.

Leaving Kum, we followed the new highway, which proved to be well engineered, and embanked more or less after the model of Indian roads; but driving along it one would have been terribly jolted, for in many places the metal had not been rolled, and in others there was none at all, though it was much needed. For the first twenty miles the road is fairly level, but a little later it rises to high ground, overlooking a large salt lake. Here we left the main track, and made a short descent to the water's edge. The sun had just set, and the arid banks of the lake were desolate and monotonous in the extreme. A few croaking birds informed us that all trace of life had not entirely disappeared, for they were evidently able to eke out a miserable existence on its banks. So, too, did myriads of small insects, which kept getting into our eyes, mouths, and nostrils to such an extent that at times we had to cover up our faces altogether, and trust to the intelligence of our horses to take us safely over some very uneven ground. We were not sorry when, leaving this dreary scene, we struck again into the hills, amongst which was situated the *mehman-khaneh*, or guest-house, of Aliabad. Here we put up for the night.

I was now nearing the capital, and the road thither passed through the famous "Valley of the Angel of Death," of which I had heard so much. I had seen many desolate stretches of flat plain, but nothing so absolutely unproductive and sterile as the long deserts I passed through that day.

At length we emerged from the valley, and mounting to the crest of an intervening chain of hills, caught sight of the hazy city in the distance. In front of it glittered the golden dome of the shrine of Shah Abdul Azim, and the level road winding its way through the plain could be traced almost up to the city gates. But it was a long journey to reach them, for rain soon began to fall in torrents, and our dejected steeds could with difficulty be induced to quicken their pace. Passing the mosque tomb at last, we entered a long avenue of double rows of trees, which transforms the approach to the city into a picturesque and leafy glade, through which glimpses of the not far distant town are occasionally caught. Not far off runs the only railway in Persia, which unites the mosque of Shah Abdul Azim with a station just inside the city

wall. It is a miniature railway indeed, for its length is only 3½ miles, and the three small cars which usually compose the train could not for a moment be compared to our large and roomy railway carriages.

Marching under the tiled arch of the city gateway, we were soon wending our way through miles of covered bazaars. As usual, the articles displayed in front of the shops were mostly of European manufacture, but Persian products were more numerous than I had noticed them elsewhere. On emerging from this labyrinth of bazaars we came upon a street along which was laid a double line of rails, and soon a well-filled tram-car passed us. Following up the lines, we entered the artillery square, a large, open space, surrounded by buildings which are called barracks. Few soldiers, however, live in them, for both men and horses find lodgings where they can in any part of the town. In the centre is a garden, around which are placed some hundred old and rusty cannons. Leaving the square by a high gateway, a long straight street, lined with trees, opened up to our view. This road is quite Western in appearance; throughout its length are rows of lamp-posts, whilst at both sides are paths for the convenience of pedestrians, and here are located most of the European legations, including that of Great Britain.

Not far off was the house of the Assistant-Director of the Indian Government Telegraph Department, with whom it was my good fortune to put up. A round of amusement was just at its height, and dances, theatricals, and picnics were the order of the day. I had time, however, to see something of the city, and to hear much of the politics of the place. The British tobacco monopoly had been cancelled, Russian capitalists were to take over and extend the rail and tramway system, and had obtained a guarantee that no further concessions for railways were to be granted by the Shah for the next five years. Things were indeed looking bright for the Muscovite, if one could believe all that one heard; but in the society of this polyglot city politics take the place of scandal, and even the babes and sucklings lisp forth their valuable opinions as to the present relative strength of England and Russia. The city is in a state of transition. The "classes" have put on all the outward forms of our Western civilisation, and the "masses" are fast following in their wake. The change is, of course, inevitable, but none the less to be regretted. European vices are more easily learned than European virtues, and the Eastern mind, in its apathy, takes more readily to the downward path. But time will show in what it will end, for however much those in authority at Teheran may outwardly ape our Western mode of life, the internal administration of the country remains Eastern, and consequently rotten to the core, and must inevitably bring about the absorption of the country by one or two great European powers.

The city of Teheran lacks the interesting associations which hover around old age. It is modern, without many of the advantages which our modern cities possess. It was built for the convenience of a king, and clusters round the palace to which it owes its origin. Its population and trade, indeed, have become great, but as the centre of Persian political life, and as the point to which the wealth of the country is drawn, its importance is to some extent artificial. Situated in what was once a

desolate waste, the indolent Persian has found himself compelled to drive back the desert from the city walls. Long lines of *kanats* bring in water from great distances, and distribute an abundant supply throughout the city. To the north-west the everlasting snows of the Shemran range form a magnificent natural reservoir, and their culminating point, the great peak of Demavend, though forty miles away, is the crowning glory of the city.

From an architectural point of view, the modern capital is much behind the ancient. I have never seen so large a city so bare of architectural adornment. The modern Persian seems to have deteriorated, and at the present time to be incapable of making the faintest effort for the revival of literature, science, or art. The army is a perfect caricature of what European armies are. Soldiers dressed in a costume designed on the model of that worn by European forces are very frequently seen in every quarter of the city. To every European establishment three or four are attached; but should the householder wish them to remain, he must give them a small weekly wage. A more slovenly, dirty, and disreputable body of men than the regular army of H.M. the Shah of Persia I have never come across. I was informed that it numbers 34,000 men on a peace footing, and that in time of war it could be increased to more than double that number; but from the slight insight I got into Persian administration, the vaunted thousands would, I think, in time of need, dwindle down to hundreds.

Amongst the people I met in the capital was the Russian commander of one of the Persian Cossack regiments. He told me the Shah had in turn secured the military tuition of Englishmen, Frenchmen, Germans, and Austrians, but all of them had successively failed to work the Persian material into shape. He has now obtained the services of Russian officers as instructors to his troops; but, as far as I could judge, they do not seem to have met with any larger measure of success than their predecessors. To a great extent the fault lies with the Government, for they expect their army to be transformed into an efficient fighting-machine, and yet are unwilling to pay the money so elaborate an instrument costs now-a-days. Radical changes, too, are necessary, and these the Government fear to make.

With regret I bade adieu to my kind host, and with an official of the telegraph department set out for an eighty-mile drive to Kasvin in a *tarantass*. This description of carriage is a large clumsy box, resting on wheels, but without springs of any kind. It is of Russian origin, and is drawn by three horses yoked in Muscovite fashion, with the circular arch, so well known from pictures, high over the withers of the one in the centre. Our road throughout lay along a fairly level plain, but there had been much rain lately, and the track being a State one, and always out of repair, was furrowed and cut up to an extent almost incredible. But the great coach went thundering along, now jolting up an ascent, now hammering down an incline. We travelled from seven in the morning till nine at night, and even then our journey was not done, but we were forced to stop, as no fresh relays of horses were procurable. Early next morning, however, we drove the final stage into Kasvin, where we drew

up in front of an imposing guest-house, built originally as a halting-place for the Shah on his first journey to Europe. Here we had to take to the saddle again in order to cross the great Elburz range, which shuts Persia off from the shores of its great northern sea. Scarcely had we started when rain began to fall, and our horses proved miserable animals, who were not able to move out of a walk without considerable exertion on our part. Near the post-house of Megrah the ground began to block up, for we had now got to the base of the great range. Here we were imprisoned by the weather for the next hour and a half, when the sky began to clear. A monotonous ride lay before us, over a country that had been deluged with water for the past week. But to delay our march was impossible, for we had barely allowed ourselves time to catch the Russian steamer at Enzeli. So onward we pushed. As we were nearing the highest point of the Kharzan pass, and were marching along a wild chasm in the mountains, we noticed indications of a renewal of the storm on the hills beyond. Soon clouds came sweeping down the hill-sides, and we were enveloped in a thick mist that almost turned the light of day into gloomy darkness. Thunder began to re-echo through the hills, and before long the storm in all its fury broke over our heads; torrents of rain descended, and vast sheets of hail, driven along the narrow defile by a wind which had increased to a hurricane, beat against our hands and faces, and numbed every limb. It was useless to attempt to push on: our horses would not face the elements, nor were we able to compel their obedience. Cascades of water leapt from every hillside; the noise of many waters, the biting blast, and the hills reverberating with peals of thunder drowned human speech. Silent on the hilltops we stood, mute spectators of a grand but awful scene.

At last the fury of the storm began to abate, and we were able to make an onward move. We had not proceeded far, when, rounding a bend in the mountain path, we came upon the caravansara of Kharzan. Our chagrin can be imagined, for, had the post-boy but told us of the nearness of the village, we should have pushed on before the storm broke, and taken shelter under the roof of the caravansara till the fury of the tempest had abated.

In this shelter we remained for an hour, and a drizzling rain was still falling when we recommenced our march. A long and difficult descent lay before us, for the Kharzan pass is 7000 feet above the level of the Caspian Sea. We were now in a region of mountains and rivers. Every valley gives birth to a rivulet, and every hillside contributes a rill to swell its volume. Trees begin to make their welcome re-appearance, and the slopes of the hills are clothed with verdure. On one side of the range is the high Persian tableland we know so well, on the other is a new, and totally different country—a land of forest and of flood, a land of emerald greenness and luxuriant vegetation.

The change is sudden, but easily accounted for; for the high hills over which we had just passed intercept the rain-bearing clouds from the Caspian, and cause them to precipitate their moisture before they pass over to the bleak Persian plains.

Gradually we descended to the main valley, and as darkness was

closing around us we forded the stream, and entered the post-house of Vauchenar, which stands upon its further banks.

The great valley by which the Sufid Rud has cleft a passage to the sea is one of the grandest of Nature's works I have ever seen. The turbulent stream, swollen by recent rains, hurled itself headlong through the valley, foaming as if in anger at the great hills which confine it to so narrow a bed. At one point, where a tiny tributary entered the great river, the road had entirely disappeared. The rivulet, dammed back by the impetuosity of the main current, had caused the banks of the road to subside, and with the greatest difficulty we were able to find the muddy inlet thus formed. Our horses floundered about, up to their bodies in slime, trying at point after point to effect a crossing; but for a long time all efforts were in vain. At last success crowned our attempts, and cautiously, in Indian file, we waded through the mud and reached the further bank. But our troubles were not yet over, for about a couple of miles lower down, where the valley broadened out, and where the road to Resht leaves the cañon-like channel of the Sufid river, no trace of our path could be discovered. All was one great sea of mud, from which a primeval forest excluded the rays of a setting sun. Trees torn up by their roots were scattered around, and great logs of timber lay half-buried in the slimy mud. We soon lost our way, and the darkness of night threatened to envelop us before we got clear of this labyrinth. The post-boy seemed to wander aimlessly through the maze, letting his horse plant his feet wherever he could discover hard ground. At last we were able to make out an opening in the trees, and on reaching this glade found that a good level road stretched along it. That night we had not to court balmy sleep, for he almost overtook us in our saddles.

Next day we had the luxury of a two-hours' drive in a victoria along a good road from Resht to Pir-i-Bazaar. Here we embarked in a small boat, and were towed down a narrow, ditch-like stream by some half-dozen men. We passed many small craft *en route*, and an hour after starting entered the large lagoon, where, spreading our sail to the breeze, we sped across the intervening waters. At last we reached the goal towards which we had been working for the past month, and lowered our sail in the haven of Enzeli, on the shores of the mighty Caspian. Our journey across Persia was accomplished.

THE PHYSICAL CONDITIONS OF THE WATERS OF THE ENGLISH CHANNEL.

H. N. Dickson, F.R.S.E.

(*With Plates.*)

In the absence of an exhaustive physical examination of the waters surrounding the British coasts, and in particular of the great fishing-grounds, it seems well, in the meantime, to discuss, as completely as possible, the conditions obtaining in certain isolated regions. Such inquiries have hitherto been confined almost exclusively to the east coast of Scotland, where much has been done by the Fishery Board for Scotland and by the Scottish Marine Station. While acting as a member of the staff of the Marine Biological Association at their laboratory at Plymouth, I had opportunities of making a physical survey of the western part of the English Channel, the results of which are presented in this paper. The cost of the investigation has been defrayed chiefly by a grant from the Government Grant Committee of the Royal Society.

It may be assumed, at the outset, that the sea-water of the English Channel is wholly derived from the Atlantic Ocean, a fact which makes its examination of particular importance, inasmuch as the work of Dr. John Gibson on the east coast of Scotland has gone far to show that, while the constitution of the waters of all the great oceans is nearly identical, it is yet possible, by employing proper analytical refinements, to detect small differences between them. Certain constants may thus be determined once for all for the waters of each of the great oceanic areas; and in the case of, for example, the English Channel, where the waters are derived from one of these areas only, the physical investigation is reduced almost entirely to a discussion of distribution of temperature. Again, in the case of the North Sea, where a mixture of water from the Atlantic and Arctic Oceans occurs, it is possible to ascertain from which of these sources the water found at any point at any particular time is derived. This method of investigation, if justified by further application, cannot fail to be fruitful of results, especially in relation to such questions as the distribution of Plankton, etc., over our great fishing-grounds.

The quantity whose value is first to be determined is denoted in Dittmar's '*Challenger*' *Reports*[1] by the letter D, where

$$D = \frac{{}^{\circ}S_{\circ} - 1{\cdot}000}{\chi}$$

${}^{\circ}S_{\circ}$ = Density of the water at 0° C. referred to that of pure water at the same temperature.

χ = the number of grammes of chlorine, or total halogen calculated as chlorine, in 1 kilogram of the water.

The chlorine determinations are made throughout by Dittmar's modification of Volhard's method, fully described in the '*Challenger*' *Report.*[2]

[1] '*Challenger*' *Reports:* Physics and Chemistry, part i. p. 56.

[2] *Ibid.* p. 4.

Density Determinations.—For the purposes of his investigation, Dr. Gibson used a modified form of Sprengel tube,[1] which was first filled with pure water at 0° C., and then with the sample of sea-water under examination. With the resources at my disposal at Plymouth, it was impossible to attain the extreme accuracy of Dr. Gibson's results, and I therefore made some experiments with the view of determining whether densities determined by means of a *Challenger* hydrometer were sufficiently trustworthy to be employed in determining values of D. It appeared that, with proper care, hydrometer determinations could be obtained consistent to ± ·00003, or at most ± ·00005, a result agreeing with those given by similar instruments in the hands of other investigators. This amount of inherent uncertainty does not preclude fairly satisfactory determinations of D, especially when a large amount of material is dealt with. It therefore remained only to inquire whether any error was introduced, either by the instrument itself or by the tables used in reducing the observations.

For this purpose 15 samples, Nos. 79 to 93, were taken from those collected in the Channel, and their densities carefully determined by hydrometer, at temperatures ranging from 13°·5 C. to 14°·5 C. These densities were reduced to 15°·56 C., and referred to pure water at 4° C., by means of Dittmar's tables [2] ($_4S_{15\cdot56}$) and then again reduced to 0° C. by the same tables, and referred to pure water at 0° C. by adding ·00013 to the last result ($_0S_0$).

The densities ($_0G_0$) of the same samples were then determined with Sprengel tubes similar in form to those employed by Dr. Gibson. At least four, and sometimes six, tubes were used for each determination, although it was not thought necessary to demand greater accuracy than could be obtained from the hydrometer. Table I. gives the results of these experiments :—

Table I.

No. of Sample.	$_4S_{15.56}$	$_0S_0$	$_0G_0$	$_0S_0 - _0G_0$
79	1·02585	1·02814	1·02822	−·00008
80	1·02576	1·02806	1·02818	−·00012
81	1·02602	1·02833	1·02847	−·00014
82	1·02596	1·02826	1·02838	−·00012
83	1·02600	1·02831	1·02845	−·00014
84	1·02591	1·02821	1·02832	−·00011
85	1·02602	1·02833	1·02842	−·00009
86	1·02600	1·02831	1·02846	−·00015
87	1·02583	1·02812	1·02822	−·00010
88	1·02581	1·02810	1·02828	−·00018
89	1·02589	1·02819	1·02836	−·00017
90	1·02585	1·02814	1·02831	−·00017
91	1·02572	1·02802	1·02808	−·00006
92	1·02577	1·02806	1·02820	−·00014
93	1·02570	1·02799	1·02808	−·00009

[1] *Sixth Report of the Fishery Board for Scotland*, p. 336.

[2] '*Challenger*' *Reports:* Physics and Chemistry, vol. i. part i. p. 70.

The last column shows a mean difference between ${}_0S_0$ and ${}_0G_0$ of $-$ ·00012, the probable error being $\pm$ ·000006 for the mean, and $\pm$ ·000024 for any one determination. In order to ascertain whether this difference was due to the use of Dittmar's tables in calculating the values of ${}_0S_0$ from those of ${}_4S_{15\cdot56}$, the densities of two samples, Nos. 81 and 91, were determined at different temperatures (t), as follows:—

	${}_0S_t$	
t	No. 81	No. 91.
2°·6	1·02820	——
4·1	——	1·02775
9·9	1·02729	——
10·9	——	1·02679
14·0	1·02649	——
13·7	——	1·02625
18·8	1·02553	——
18·7	——	1·02509
26·0	——	1·02314
27·1	1·02317	——

Plotting these observations, we get two exactly parallel curves. A third curve drawn midway between these is well represented at temperatures below 18° C., by the equation

$$y = 1{\cdot}02816 - {\cdot}000047t - {\cdot}0000060t^2$$

which gives ${}_0S_t = 1{\cdot}02598$, and ${}_0S_0 = 0{\cdot}02816$, the latter value being identical with what may be obtained from the former by the use of Dittmar's tables, which do not therefore introduce any error.

The differences observed must accordingly be due to some peculiarity in the hydrometer observations. In comparing determinations made with a hydrometer of almost exactly similar dimensions, and with a delicate plunger arrangement, Dittmar found differences in the same direction and of exactly the same amount.[1] These he dismisses by saying, 'There is no need of our searching for the cause of this error; it is fully explained by the inherent uncertainty in the hydrometer's position of equilibrium'—a statement with which, in view of the data of Table I., it is scarcely possible to agree. It will also be seen later that another series of 27 samples taken from the Channel, the densities of which were determined by hydrometer only, gives values of D identical with those of the sixteen just discussed, *if* we apply a correction $= +{\cdot}00012$ to the hydrometer densities. Further, it may be noted, although much stress cannot be laid on the point, that in comparing the amounts of chlorine (χ^1) in the *Challenger* samples, calculated from Buchanan's hydrometer densities, with the amounts (χ) determined directly, Dittmar found a constant difference $\chi^1 - \chi = -{\cdot}042$ over and above errors due to observation, which would give a correction $+{\cdot}00006$ for the hydrometer densities.[2]

On these various grounds it seems fairly reasonable to conclude that, apart from observational errors, there is a constant difference between the

[1] '*Challenger*' *Reports:* Physics and Chemistry, vol. i. p. 85.
[2] *Ibid.* p. 88.

results of these two methods of determination. I have not had an opportunity of making full inquiry into the cause of this difference, which is certainly not obvious; but, in order to remove any remaining doubts as to its actual existence, the following rough experiments were made. Two solutions of pure sodium chloride were made up, and their densities determined with Sprengel tubes—a matter of some difficulty on account of the incrustation of salt forming on the tips of the tubes. Subjoined are the results:

No. of tube.	Solution I.	Solution II.
1	1·06543	1·06369
2	1·06520	1·06368
3	1·06533	1·06365
Mean,	1·06532	1·06368

Observations were then made with the hydrometer at different temperatures, as in the case of sea-water:

	${}_{\circ}S_t$	
t	Solution I.	Solution II.
2°·7	——	1·06296
6·0	——	1·06214
10·0	1·06273	——
11·3	1·06261	——
11·6	——	1·06083
18·1	——	1·05871
19·0	1·06029	——

These, again, give two parallel curves, intermediate between which we get one represented by

$$y = 1{\cdot}06425 - {\cdot}000215t - {\cdot}0000020t^2$$

Hence for the mean of the two solutions we get ${}_{\circ}S_{\circ} = 1{\cdot}06425$ by hydrometer, against 1·06450 by Sprengel tubes—a difference of $-{\cdot}00025$. Since the constants of the hydrometer are determined from observations made in pure water, the difference in that case is obviously zero, and the experiments suggest that it depends on the density of the solution, its value for this particular instrument being of the form

$$\triangle = {\cdot}0042\ ({}_{\circ}S_{\circ} - 1).$$

The solution of the problem is, however, foreign to the subject of this paper, the present purpose being merely to justify the application of a correction $= +{\cdot}00012$ to the hydrometer determinations concerned, all of which have values near 1·028. The values of ${}_{\circ}S_{\circ}$ given below are invariably those calculated from ${}_4S_{15{\cdot}56}$ *plus* the correction ·00012.

If we dilute a given sample of sea-water by adding pure water to it, the value of D, as defined above, will obviously remain unaltered, the relation of the percentage of chlorine to the excess of density over that of fresh water being the same. The waters poured into the sea by most rivers may, in general, be taken as nearly pure, the total salts contained in them being as a rule exceedingly small in amount as com-

pared with those originally present in the sea-water, so that, if the sea-water, after dilution, be evaporated down to its former density, it will be practically unchanged. Under certain circumstances, however, river-water has been found to contain salts derived from the land which materially affected the value of D, the tendency as a rule being to increase it. The change may nevertheless remain comparatively small, and in such a case the determination of another element becomes specially important, viz. the alkalinity. This quantity, which represents the total bases present as carbonate, is determined by a method due to Tornöe, and is expressed in milligrams of carbonic acid per litre. For inquiries like the present it is convenient to employ a factor D_A, calculated in exactly the same manner as Dittmar's D, except that the chlorine (χ) is replaced by the alkalinity.

The methods of analysing sea-water outlined above are in great part due to the late Professor Dittmar, and are developed in his great work on *The Composition of Ocean Water*. The application of the quantities D and D_A to the identification of waters from different sources was first proposed by Dr. John Gibson, who succeeded in recognising currents from the Arctic and Atlantic Oceans, and from the Baltic, in the North Sea.

The English Channel occupies an area about 300 miles in length, 100 miles wide at the mouth, narrowing to 20 miles at the Straits of Dover. With the exception of a long, narrow valley to the north of the Channel Islands, known as Hurd's Deep, in which soundings of 60 to 70 fathoms are obtained, the bottom slopes upwards with great uniformity from west to east, the average depth being about 50 fathoms at the mouth and 20 to 30 fathoms at the entrance to the Straits. On the northern, or English side, the coast takes the form of a succession of sickle-shaped bays, on the western side of which it runs nearly north and south, forms a right angle at the head, and trends gradually southward farther to the east. These bays decrease regularly in size from west to east, the most typical in point of shape being that between Start Point and the Bill of Portland.

On the French side the arrangement is in general just the reverse—on a much larger scale; the coast takes a north and south direction on the east side of each inlet, runs up to a sharp angle, and turns westwards and northwards.

Tides.—Plate I. shows the co-tidal lines for the English Channel, the numbers denoting the interval of time (in hours) between full and change of the moon and the first subsequent high-water at the places through which the lines pass. The lines may be taken to represent the progress up-channel of the great tidal wave which travels in a north-easterly direction from the South Atlantic, and divides into two branches on reaching the SW. extremity of England. The mean range of spring tides at the mouth of the Channel is about 17 feet, and at the upper end an increase of 3 to 4 feet is probably due to the diminished breadth.

Since the Channel does not form a closed inlet, the times at which

the tidal streams change their direction do not coincide with the times of high and low water; and at the western end, as far up as the meridian of Plymouth, the conditions found in an open channel may be said to persist—the flood and ebb currents continuing to run for two to three hours after high and low water. Farther east, however, the configuration of the land and the influence of the opposite tides from the North Sea produce an arrangement of great complexity, the nature of which was first fully explained by Rear-Admiral Beechy (*vide Phil. Trans.* 1848 and 1851). The normal progressive changes of stream cease at a point between the Start and the Gulf of St. Malo, where the tides become extremely irregular. From this point the "true Channel stream" extends to the junction with a similar stream from the North Sea, which oscillates between Beachy Head and the North Foreland. The stream has the peculiarity that its direction of flow changes, throughout its entire length (about 180 miles), at almost the same instant, the times corresponding with those of high and low water at Dover.

Now, the hour of high water at Dover approximately coincides with that of low water at the region where the oceanic tidal stream terminates, and conversely; but since, in the latter case, the flood and ebb currents continue for nearly three hours after the changes of tide, it is obvious that, for that period after high water at Dover, the Channel and ocean streams must meet, while after low water a separation must occur. These conditions, aided by the configuration of the coast-line, cause a strong inflow and outflow in the Bay of St. Malo. Hence we have with spring tides the large range of 32 feet at Jersey, 42 feet at St. Germain, 37 feet at Granville, and 35 feet at St. Malo. On the other hand, the tides on the English coast are considerably reduced—to 12 feet at Exmouth, 11 feet at Bridport, 7 at Portland Breakwater, and 6 at Poole, the streams being sometimes scarcely sensible, and seldom exceeding a speed of 2 knots. To the east of Start Point a narrow stream flows round close to the coast, and rejoins the main Channel stream at the Bill of Portland. Three miles off Beer Head the direction of the tide is simply round the compass, with but little velocity; and near this point we have the centre of a slowly rotating vortex, in which the water remains almost undisturbed. Similar conditions are found near Portland and Weymouth Roads.

Between Poole and Southampton the phenomenon of a double high-water occurs. The tidal wave enters first by the western channel round the Needles, giving the first high water at Southampton, and by the eastern channel some time later, causing the second. The ebb tide from the Solent falls into Poole Bay, and produces the second flood there. The interval between the two high waters is of course greater at Poole than at Southampton, being $3\frac{1}{2}$ hours and $2\frac{1}{2}$ hours respectively.

The tidal system in the Channel is everywhere liable to considerable modifications by the winds, those blowing towards the land tending in general to increase the range, and conversely. Where the prevailing winds are off-shore, as for example between Exmouth and the Start, there is probably an up-welling of bottom water; but this is of course independent of tides.

Physical Observations.—The first series of observations, made in June 1891, was published in the *Journal of the Marine Biological Association.*[1] Since the publication of that paper, which gives the densities ($_4S_{15\cdot56}$) and alkalinities of thirty-six samples, I have completed the chlorine determinations for twenty-seven of the same series. Table II. gives the values of $_\circ S_\circ$ obtained by reducing $_4S_{15\cdot56}$ by Dittmar's tables, and adding the correction +00012—the chlorines (χ)—the values of D—and finally those of D_A.

Table II.

No. of Sample	$_\circ S_\circ$	χ	D	D_A
17	1·02845	19·54	1·456	·539
18	1·02843	19·56	1·454	·545
19	1·02850	19·67	1·449	·538
20	1·02860	19·67	1·454	·542
21	1·02863	19·68	1·455	·555
22	1·02879	...	...	·548
23	1·02847	19·57	1·455	·545
24	1·02855	19·61	1·456	·544
25	1·02852	19·61	1·454	·544
26	1·02845	19·61	1·451	·547
27	1·02848	19·58	1·455	·547
28	1·02850	19·60	1·454	·546
29	1·02851	19·60	1·455	·546
30	1·02853	19·62	1·455	·542
31	1·02856	19·62	1·456	·547
32	1·02856	19·63	1·455	·555
33	1·02848	19·59	1·454	·561
34	1·02843	19·57	1·453	·560
35	1·02832	19·45	1·457	·554
36	1·02825	19·49	1·450	·553
37	1·02848	19·55	1·457	·557
38	1·02846	19·56	1·455	·548
39	1·02850	...	...	·548
40	1·02846	19·57	1·457	·556
41	1·02855	19·60	1·457	·550
42	1·02855	19·59	1·457	·560
43	1·02852	19·59	1·456	·558
44	1·02852	19·57	1·457	·547
45	1·02852	19·61	1·455	·552

The points of observation are numbered I. to XV. on Plate I., and to save reference it may be noted that samples having odd numbers were collected at the surface, and even at the bottom, beginning with 13 and 14 at Station I., and omitting Station III., at which no samples were taken. This holds good up to Sample 41, surface at Station XIII. Sample 42 was taken from a depth of eight fathoms, and 43 bottom, at XIII.; 44, 45, and 46 at surface, seven fathoms, and bottom at Station XIV.; 47 and 48, surface and bottom Station XV.

[1] New Series, vol. ii., No. 2.

TABLE III.

No. of Sample.	Date.	Hour.	Position.	Depth. Fath.	Tide.	Wind. Direction.	Wind. Force.	Weather.	Temp. of Air.	Depth of Observation.	Temp. of Sea T.	$_4S_{15\cdot56}$	S_T	$_0S_0$	$_0G_0$	χ	D	Alkalinity.	D
79	17.11.91	2.15 p.m.	I. Bolt Head, NE. by E. 2½ m.	30	1½ hrs. fl	SW.	0–1	c.		0	52·8	1·02585	1·02666	1·02826	1·02822	19·41	1·454	51·9	·544
										8	52·6								
										13	52·9								
										18	52·8								
										20	52·6								
										25	52·9								
										29	52·9	1·02576	1·02657	1·02818	1·02818	19·35	1·456	52·3	·539
80	,,	6.20 p.m.	B. Start Pt. WNW. 30 m.	35	3½ hrs. fl.	lm.	0	b.	50·7	0	53·5								
										15	53·7								
										25	53·6								
										34	53·7								
81	,,	11 p.m.	VIII. St. Catherine's Lt. ENE.	35	3 hrs. ebb.	W'NW.	–1	c.	50·5	0	53·9	1·02602	1·02672	1·02845	1·02847	19·54	1·457	50·9	·559
										5	54·2								
										10	54·0								
										15	54·0								
										25	54·0								
										34	54·0	1·02596	1·02666	1·02838	1·02838	19·48	1·457	50·9	·568
82																			
83	24.11.91	3.15 a.m.	XIV.	29	4 hrs. ebb.	E.	2	c.	31·0	0	50·0	1·02600	1·02710	1·02843	1·02845	19·53	1·457	50·8	·560
										2	52·8								
											52·8								
										7	52·8								
										10	52·8								
										20	52·8								
										28	52·7	1·02591	1·02674	1·02833	1·02832	19·49	1·453	52·0	·545
84																			
85	,,	5.50 a.m.	XIII.	25	L.W.	E.	3	o.		0	51·4	1·02602	1·02698	1·02845	1·02842	19·53	1·455	51·9	·548
										2	53·0								
										5	53·0								
										15	53·1								
										24	53·1	1·02600	1·02680	1·02843	1·02846	19·56	1·455	51·2	·556
86																			
87	,,	7.30 a.m.	C. West Bay.	20	1 hr. fl.	E.	1	b.		0	50·4	1·02583	1·02689	1·02824	1·02822	19·41	1·454	51·2	·551
										3	52·0								
										5	51·8								
										8	51·9								
										10	52·0								
										19	51·9	1·02581	1·02672	1·02822	1·02828	19·39	1·455	51·0	·554
88																			
89	,,	1.40 p.m.	D. Off Lyme, 5 m.	20	1½ hrs. ebb.	N.	1–2	b. f.°		0	51·2	1·02589	1·02687	1·02831	1·02836	19·47	1·457	51·8	·549
										1	51·9								
										4	52·0								
										9	52·7								
										14	52·1								
										19	52·1	1·02585	1·02674	1·02826	1·02831	19·42	1·458	49·6	·571
90																			
91	,,	3.40 p.m.	E. Off Exmouth.	16	3½ hrs ebb.	N.		c.	42·6	0	51·2	1·02572	1·02670	1·02814	1·02808	19·34	1·452	49·7	·565
										2	51·7								
										5	52·3								
										8	52·5								
										10	52·6								
										15	52·6	1·02577	1·02662	1·02818	1·02820	19·34	1·458	50·6	·557
92																			
93	,,	5.15 p.m.	Off Berry Head.	17	5 hrs. ebb.	N.	1	b. f.		0	50·8	1·02570	1·02673	1·02811	1·02808	19·33	1·453	51·4	·546
										1	51·8								
										2	51·9								
										4	51·9								
										7	52·0								
										12	51·9								
94										16	51·9	1·02574	1·02665	1·02815	..	19·31	..	51·4	..

TABLE IV.

Date.	Hour.	Position.	Depth. Fath.	Tide.	Wind.		Weather.	Depth of Observation.	Temp. of Sea T.
					Direction.	Force.			
1.3.92	2.30 p.m.	I.	22	L.W.	ENE.	6	p. c.	0	46·6
								5	46·5
								8	46·3
								10	46·4
								12	46·4
								17	46·3
								21	46·3
,,	6.30 p.m.	XIV.	25	4 hrs. fl.	ENE.	6	q.	0	44·1
								5	44·9
								10	44·7
								20	44·8
,,	9.30 p.m.	XIII.	20	1½ hrs. ebb	ENE.	6	q.	0	44·6
								5	45·0
								10	45·3
25.6.92	5.15 a.m.	Z.	43	H.W.	SW.	0–1	c.	0	54·6
								5	54·1
								10	54·0
								20	54·0
								42	54·0
,,	9.30 a.m.	III.	36	4 hrs. ebb	SSE.	0–1	o.	0	53·7
								5	52·7
								10	52·7
								35	52·6
,,	1 p.m.	B.	32	1½ hrs. fl.	SSE.	1	o.	0	53·6
								2	52·7
								5	52·5
								10.	52·5
								31	52·4
,,	3.20 p.m.	XIII.	26	2½ hrs. fl.	SW.	2	m. r-°	0	55·0
								5	54·4
								10	54·3
								25	54·3
,,	5.30 p.m.	E.	19	4½ hrs. fl.	SW.	4	o. r.°	0	53·9
								5	53·3
								10	53·1
								18	53·0
19.7.92	12.15 a.m.	I.	30	½ hr. ebb	NNW.	1	c.	0	56·0
								10	55·6
								30	55·6
,,	4.30 a.m.	B.	32	5 hrs. ebb	NNW.	2	b.	0	55·7
								5	55·6
								10	55·5
								30	55·0
,,	8.20 a.m.	VII.	70	1 hr. fl.	NNW.	1	b.	0	56·3
								10	55·7
								30	55·7
								70	55·7
	1.15 p.m.	VIII.	35	5½ hrs. fl.	W.	2	r.	0	56·7
								5	56·0
								10	56·0
								35	55·9
21.7.92	12.40 a.m.	XIII.	25	3½ hrs. fl.	N.	1	b. ∝	0	56·8
								5	55·9
								10	55·9
								25	56·0
,,	3.20 a.m.	XIV.	26	H.W.	NW.	1	b. 8	0	55·6
								5	55·0
								10	54·8
								26	54·7
,,	5 a.m.	E.	16	1½ hrs. ebb	NNW.	0–1	b.	0	56·6
								5	55·9
								10	55·7
								16	55·7
,,	9 a.m.	I.	30	5½ hrs. ebb	Calm.	0	c.	0	56·3
								5	55·7
								10	55·7
								30	55·7

Table III. gives details of the second series of observations, made in November 1891. Columns 1 to 12 require no explanation. Column 13 gives the densities $_4S_{15\cdot56}$ determined by hydrometer; column 14 those *in situ*, calculated from the values of column 13. Column 15 gives $_\circ S_\circ$, also calculated from column 13, and 16 the densities determined by Sprengel tubes. Columns 17 and 19 give the chlorines and alkalinities, and 18 and 20 the values of D and D_A, deduced from them by means of column 16. The letters B C D E and F on Plate I. show the positions of new stations in this series.

Table IV. contains all the subsequent observations. The discussion of the previous series showed that these might be restricted for the most part to observations of temperature, and only three samples were collected: No. 95 at a new station Z near the French coast (*vide* Plate I.), and Nos. 96 and 97 at Stations B and E, all these being surface samples. The hydrometer gave the following results:—

No.	$_4S_{15\cdot56}$	$_4S_t$	$_\circ S_\circ$ corrected.
95	1·02604	1·02670	1·02847
96	1·02602	1·02678	1·02845
97	1·02597	1·02675	1·02839

A consideration of Tables II. and III. shows that the values of neither D nor D_A are affected by any regular variation; we may accordingly take these values as repeated observations of the same thing. Hence we find from Table II.:—

Probable value of D	=	1·4548
Probable error of this value	=	± ·0003
„ „ of any observation	=	± ·0012
Probable value of D_A	=	·5494
Probable error of this value	=	± ·0008
„ „ of any observation	=	± ·0043

and from Table III.:—

Probable value of D	=	1·4554
Probable error of this value	=	·0003
„ „ of any observation	=	± ·0013
Probable value of D	=	·5541
Probable error of this value	=	± ·0016
„ „ of any observation	=	± ·0063

results which lead to the following conclusions:—

1. The water of the English Channel, as far east as a line joining the Isle of Wight and Cherbourg, is constant in composition at different seasons of the year.

2. The value of D for this water may be taken as closely approximating to 1·4551, and of D_A to 0·551. These values agree with Dr. Gibson's original determinations, that for D exactly, and that for D_A closely, although my value is slightly larger, as might almost have been expected. They seem, therefore, to give the strongest confirmation of the soundness of Dr. Gibson's method, and to show further that, by taking proper precautions, the hydrometer can be made to give results sufficiently accurate for the purpose, thereby avoiding the most difficult and laborious part of

Dr. Gibson's work—the determination of density with a very high degree of accuracy by means of Sprengel tubes.

It does not seem premature, considering all the evidence, to accept the values given of D and of D_A as characteristic of the water supplied to the British coasts from the Atlantic, and probably of Atlantic water proper.

Temperature Observations.—The conclusions reached with reference to D and D_A, and a study of the density observations (including the "check" samples 95, 96, and 97) show that further physical investigation of the area considered may be reduced to a discussion of the distribution of temperature.

The first point to be noted is, that in all the series over the whole area dealt with, the temperature at any point remains sensibly constant at all depths more than 6 to 8 fathoms below the surface, an upper layer 3 to 5 fathoms in thickness being apparently subject to temporary local weather conditions, which may or may not produce a distribution similar to that found underneath. Leaving this surface layer out of consideration for the present, and dealing with the main body of water, it is easy to recognise an axis along which minima of temperature are to be found in summer and maxima in winter, the gradients on either side being steepest at the annual maxima and minima. This axis runs nearly parallel to the coast between Plymouth and the Start, at a distance of 10 to 20 miles; further east of the Start it broadens out into a lenticular-shaped area, and then again narrows at a point about the middle of a line joining St. Alban's Head and Cape de la Hague, whence it apparently continues its course almost exactly in mid-channel. Stations I., II., B, and VIII. may be taken as lying on the axis.

Hence it appears that the changes of temperature which occur in the oceanic water of the Atlantic are propagated along the tidal stream by the mixing caused by the tide itself, as far as the area of variable tides lying south-east of the Start. The tidal motion of the water in this area is sufficient to make its temperature uniform throughout; but as there is little motion of translation, it serves as a storehouse of heat in winter and of cold in summer, most of which is distributed to the "true channel stream" described above, and by it to the eastern part of the Channel, and also, on account of the strong tidal inflow and outflow, to the sea surrounding the Channel Islands. Plate 2, Fig. 1, shows diagrammatically the form of the axis.

Under normal conditions, the gradient of temperature on either side of the axis would be uniform, its steepness depending at any point partly on the relative velocity of the tidal streams—*i.e.* on the rate at which changes of temperature are propagated by mixing—and partly on the meteorological conditions existing close to land. So far as appears, these conditions are fairly realised on the southern side of the main oceanic stream, and on the eastern sections of the bays which form the south coast of England.

But in the western parts of those bays an abnormal distribution of temperature is to be expected, because, as before stated, considerable bodies of water lie almost cut off from the influence of tidal streams.

Hence, in the area north-east of the Start (Stations XIII. and XIV.), which is the most typical case, the smallest annual range of temperature in the whole Channel is observed. Station XIV. gave both in 1891 and 1892 absolutely the lowest summer temperatures, while in November 1891 the readings were sensibly higher at XIII. and XIV. than at the surrounding stations. A further result of the comparative isolation of the water in this region is the liability of the surface layer to sudden changes of temperature. Thus in June 1891, after several days of calm, hot weather, the readings at Station XIV. were the highest of the whole Channel, to a depth of five fathoms, and the lowest below seven fathoms (*vide* Figs. 2 and 3, Plate 2).

Any discussion of the bearings of these facts on the climates at different parts of the coast, or on fishery questions, is beyond the scope of this paper. It may be remarked, however, with reference to the latter subject, that the region of isolated water just noticed coincides almost exactly with the Brixham fishing-grounds. It is true that the fishing is largely prosecuted on that ground by trawlers, the nature of the bottom being specially suitable for trawling, perhaps on account of deposits which have taken place in the comparatively undisturbed water. But the region is known to abound in the young of various kinds of fish; and if we compare the results obtained in the Channel with the fact that observations on the east coast of Scotland show a tendency for large catches of herring to be made in local cold areas, or areas where the water is probably welling up from below, it seems worth while to inquire whether these quiescent areas are not specially spawning-grounds, and whether the regions in more active tidal communication with, in the case of British waters, the Atlantic are not specially feeding-grounds. Much light must be thrown on the problem by an inquiry into the distribution of Plankton in the two cases.

My best thanks are due to Mr. Frank Hughes, formerly chemist to the Marine Biological Association, for invaluable assistance, particularly in the chemical part of this investigation.

THE DISTRIBUTION OF AQUATIC PLANTS AND ANIMALS.

By H. B. Guppy, M.B., F.R.S.E.

A SATISFACTORY explanation of the distribution of fresh-water organisms, extending as it would by implication to problems of much greater complexity, becomes of the highest importance to the student of nature. Our pond-weeds and duck-weeds, our *Infusoria* and other minute aquatic creatures, our fresh-water crustaceans, insects, and molluscs, occurs often over extensive areas of the globe. Lyell, Darwin, Hooker, De Candolle, and many other eminent men of science, have discussed this question, and their various opinions would afford material for a separate paper. Here, however, I can only briefly indicate the line of reasoning that seems likely to prepare the way for the investigation of the problem.

Darwin, in his *Origin of Species*, mainly relied on the exceptional means of dispersal possessed by fresh-water organisms. Semper, in his book entitled *The Natural Conditions of Existence as they affect Animal Life*, took exception to this explanation as not generally applicable, but he laid down principles of great value to the impartial inquirer. Wallace, in his *Geographical Distribution of Animals*, pointed out the two-fold nature of questions affecting distribution, or rather the two sets of opposing facts as he terms them when speaking of insects, viz., the powers of dispersal on the one hand and the frequent dependence on special conditions of life on the other hand. To put it in other language, an insect, in order to possess a wide range, requires not merely unusual means of dispersal, but also the frequent occurrence of the conditions necessary to its existence. In his later work on *Island Life* Wallace introduces into the discussion the element of time, and remarks, with regard to plants generally, that they have existed long enough in most cases to have been carried to all suitable localities on the globe, and that the determining factor of their distribution is to be found in their powers of adaptation to the new conditions. In plain words, this simply means that *time has long since discounted the means of dispersal, and that as regards explaining plant distribution the study of their means of dispersal is often superfluous.*

If this is the correct view of the matter it must apply to fresh-water organisms generally, and the problem of their distribution, deriving thereby a very different aspect, will be solved not so much by the study of their means of dispersal as by patient investigation of the conditions in which they live. The teachings of Semper should here come into great prominence.

An independent but somewhat circuitous line of research has led me to adopt a similar view. Whilst engaged for eighteen months in experimenting on the floating capacities of the seeds and seed-vessels of river-plants, uncomfortable doubts kept frequently interrupting the harmony of my reflections. An inquiry into the "How" did not at such times seem to me to be of much immediate interest when I knew nothing of the "When"; and on finding ultimately that I had been long engaged in experimenting on plants that flourished, in what is now Norfolk, before the Glacial Epoch,—for such is the story of the Forest-Bed,—my interest in the study of plant dispersal, as explaining distribution, sensibly waned. I then perceived that plants that had been existing so long had probably had their seeds carried over the world many times over, and that it was not so much a question of their ability to reach distant localities as of their capacity of maintaining themselves in a new region, and I soon saw that this must largely depend, in the case of widely distributed plants, on the frequent occurrence over the globe of the same conditions. This conclusion, however, only promises to lead to the solving of the problem by opening up vast fields of observation and experiment.

What, then, is the character of the conditions that cause fresh-water faunas and floras to be so similar over the globe, whilst the terrestrial organisms are frequently so diverse? It is *the uniformity of the conditions in which they live.* The fact that in a warm August day the temperature of the Thames at Kingston ranged only from 64° to 66° F., whilst the

air in the shade varied between 50° and 72° F., opened my eyes to a feature in aquatic life which previously I had completely ignored. As far as I can judge at present, the annual range of Thames temperature above the influence of the tide would be 35° to 70° F., but the small diurnal range is a constant feature, and the most important one. Of course, thermometric observations of river-temperature have been frequently made in various parts of the world, and I am touching here on no novel subject. Local conditions affect the absolute temperature more than the daily range; and, amongst numerous observations relating to these matters, I have found few so instructive as an analysis of those made many years ago by Hooker in the Himalayas. The general subject, however, of the temperature of rivers, ponds, and ditches, I hope, when my year's observations are complete, to consider in a future paper. But the point I wish here to dwell upon is the equability of river-temperature and of large bodies of fresh water generally, in connection with aquatic life.

Let us contrast the thermal conditions of aquatic life in the Thames with that in which land organisms live in this part of England. In the Thames there is an extreme annual range of, probably, from about 35° to 70° F., and a diurnal variation of 1° to 3°.[1] The air in the shade ranges in the course of the year between 20° and 90° F., but this does not include the direct sun-heat on the one hand and nocturnal radiation on the other hand, the diurnal variation being usually between 8° and 25°, sometimes, however, more, and sometimes less. The annual range of the daily means of the river-temperature will probably prove to correspond roughly with the range of the monthly means of the temperature of the air in the shade, though in summer the river-temperature is a few degrees higher than the monthly means.

But the comparative equability of river-temperature is scarcely the most striking of the conditions that constitute the uniformity of aquatic life. Water organisms in rivers are scarcely affected by a great variety of physical influences that so largely determine the stations of plants and animals, such as diversities of soil, humidity, nocturnal radiation, wind, and many of those complex agencies that give endless variety to climate and to terrestrial life. A strictly aquatic plant is but slightly affected by conditions that completely change the character of the terrestrial vegetation. Thus we are not surprised to find many of our English river-plants amidst very different surroundings: Potamogetons in Australian rivers that drain regions mainly characterised by the *Eucalypti*; *Ceratophyllum* in the tepid waters of the rivers of Fiji and New Guinea; whilst the small genus of *Myriophyllum* is represented in the fresh waters of the greater part of the globe. Therefore, the wide

[1] Dr. Mill, who has much experience in taking sea-temperatures, kindly suggested a specially-constructed box containing maximum and minimum thermometers as most fitted for these river observations. Anglers and bargees are, however, very inquisitive in such matters, so I found the best plan was to find the usual times of maximum and minimum temperatures by taking observations every four hours with an ordinary thermometer. Then, by taking the temperature at sunrise and in the afternoon (early in winter and later in summer) I was able to get the daily range without much trouble.

distributions of aquatic organisms causes no astonishment, and it may subsequently be found that the more complete the submergence of an organism during its whole life-history, the more extended will be its range. River plants and animals find much the same conditions over the greater part of the globe, and in time as well as space these conditions would preserve their uniformity. For these reasons we should expect to find that fresh-water organisms have changed far less in geological time than the forms of terrestrial life. In the never-ceasing changes that have often revolutionised the earth's surface aquatic organisms would have but little participated.

The extensive means of dispersal possessed by fresh-water plants and animals would not explain their wide distribution, if the conditions of aquatic life were not very similar over a large portion of the earth. To take the case of plants. The process of dispersal is ever going on in the case both of land and water plants; but its results are mainly determined by the reception the plant receives in its new country. If the conditions are not very different from those of its home, it will flourish and produce its kind. Now one can scarcely doubt that the countless migratory birds that visit this land must bring with them great numbers of seeds of plants that would never become permanently established here. Physical conditions affecting germination, foliation, flowering, fruiting, and the fall of the leaf may, as we can readily imagine, be found by a new arrival to be antagonistic to its establishment. Soil, elevation, temperature, radiation, humidity, rainfall, sunlight, not to mention the presence or absence of other forms of life on which the plant may depend, afford an ever-varying combination of conditions which are represented in the diversification of the land flora. Hence, whilst a particular region is able to preserve through ages its peculiar land flora, its rivers and ponds are stocked with plants that are found over a large part of the globe.

These principles, however, involve other questions. Bearing in mind that plants have existed long enough to reach, in the great majority of cases, all suitable stations on the earth's surface,—for this is the great lesson of the pre-glacial Forest-Bed of Norfolk,—it follows that the alpine floras of the mountain tops of temperate and tropical regions may be accounted for on similar grounds. It cannot be denied that, like the widely-ranging plants of tropical rivers, these plants have chosen a suitable station, and the only point at issue is as to how they got there. To go back to the glacial ages in order to find an answer to this query, is to acknowledge the antiquity of these alpine plants, an admission which dispenses with the necessity of any other explanation. But these principles would be of far wider extent. They imply not only a great range of species where the conditions are uniform, as I have shown to be the case with aquatic organisms, but they involve a large number of convertible species where the conditions are diverse, as on the land.

Take, for instance, *Bidens cernua*, a land plant in the strictest sense, though it grows in marshes. Its achenes are provided with recurved prickles, by which it attaches itself to passing bodies even more firmly than the burrs of *Galium aparine*. In the course of ages it must have

had an enormous number of opportunities of establishing itself in the tropics, but it is not included as a tropical plant, though there are widely ranging tropical species of the genus. The inference, therefore, is that this plant has one habit in the tropics and another in temperate regions, differences to which specific values have been applied. Years of observation and experiment alone can settle this point; but I may remark that I have grown these plants in a very small greenhouse under the hottest and driest of conditions, in fact in some cases in sandy soil, the chief differences, as far as I could judge, in the first generation being a diminution in the length of the achene and greater firmness of the stems. Specific and even generic characters may directly depend, as Semper points out, on external conditions; and it would be difficult to imagine a more striking case than that exhibited in the experiments of Schmankewitsch, where a salt-water crustacean of the genus *Artemia*, was transformed by gradual dilution of the water during successive generations into a crustacean possessing the characters of the fresh-water *Branchipus*.

How patient we have to be in such investigations is well illustrated in two of my own experiments. In testing the buoyancy of the carpels of *Ranunculus sceleratus* in sea-water, I found that they germinated there after floating several months, and it was elicited by the second experiment that these carpels require months of soaking in sea-water before they can germinate there. In fresh-water they germinate in a few days or weeks, but the sea-water seedling has a strikingly different appearance from the fresh-water seedling. Then, again, I find that it would not be very difficult to convert *Ranunculus repens* into an aquatic plant. I have two small plants that have passed the whole of their existence of five or six months under water; they have produced in each case four or five leaves. *Atriplex patula*, however, is unable to do more under water than protrude its cotyledons above the mud.

Returning to the subject proper of this paper, I may remark that merely from the point of view of the thermal conditions affecting fresh-water plants and animals, many interesting matters await investigation, and not the least interesting will be the effect of the diurnal range of temperature on these organisms. Beginning with the "splash" and the rivulet, where the daily changes of temperature approach those of the air, the diurnal range diminishes until it almost disappears in the lake and the river. At some future time I hope to deal with these questions in a separate paper. They must be closely connected with the stations of aquatic organisms, and also with their distribution. As a general rule, the larger the bulk of water the more equable the temperature, and the nearer the approach to the thermal conditions which fresh-water organisms enjoy in warmer zones.

Here I can only touch lightly on these subjects; but if it should prove, as I think it will, that the plants and animals of our rivers live in thermal conditions nearer to those of tropical rivers than in the case of the respective land plants, then some rather curious speculations would suggest themselves. Take the northern hemisphere, for instance. Since the tropical river plants and animals would extend further from the equator than the land plants, they would, when the climate of the

northern hemisphere became warmer, be the first to reach us; they would also be the last to retire as the climate cooled. It would, in fact, require a less change of climate to introduce tropical water-plants and water-animals into our rivers than in the case of land plants. I cannot here enter into the various geological questions that these speculations would affect; it will be sufficient merely to indicate a line of inquiry.

In conclusion, I would point out that in my use of the term of uniformity as applied to aquatic conditions, I have employed it in the sense of their uniformity as compared with land conditions.

OBITUARY: 1892.

By J. W. McCrindle, M.A., M.R.A.S.

Bellew, Dr. Henry Walter, C.S.I., Surgeon-General, Bengal Army.—This distinguished Indian officer died at Farnham Royal, on the 26th of August last, about six years after his final retirement from service in the East. He was born in India in 1834, the son of Major H. W. Bellew, who perished in the disastrous retreat from Kabul in 1842. He studied medicine in this country, and after acquiring some practical knowledge of the art during the Crimean War, obtained a commission as an Assistant-Surgeon in the Bengal Service, and went out to India, in 1856. He was sent, soon after his arrival, to the Peshawar frontier to take medical charge of the Guides, and not long afterwards was selected to accompany Major (now Sir Henry) Lumsden on his famous mission to Kandahar. Of this mission he published an account, under the title of *Journal of a Mission to Kandahar in* 1857 *and* 1858. This work, which showed how keen was its author's insight into the subtleties of the Oriental character, was pronounced by the Government of India to be a useful contribution to our knowledge of Afghanistan. His next publication was *A General Report on the Yusufzais*, the material for which he had collected during the Ambeyla Campaign, and while he was Civil Surgeon at Peshawar; and this was followed by his *Grammar and Dictionary of the Pukhto Language*, which long continued to be a work of standard authority. In 1871, and from time to time afterwards, he was employed on political missions, as, for instance, Pollock's mission to Seistan, Goldsmid's to Persia, and Forsyth's to Kashgar and Yarkand. During the Afghan War in 1879, he acted as Chief Political Officer at Kabul, a post for which his intimate knowledge of frontier affairs, as well as his friendship with the Amir Sher Ali, to whom he had acted as interpreter at the Umballa Durbar, peculiarly qualified him. He embodied the knowledge which he acquired by serving on missions in works which are of permanent value. The best known are those entitled *From the Indus to the Tigris*, and *Kashmir and Kashgar*. The elaborate paper on the *Ethnography of Afghanistan*, which he submitted to the International Congress of Orientalists held in 1891, we reviewed at some length in the May number of this Magazine.

Dr. Bellew was married to the sister of a man of kindred spirit and

achievements, the late Sir Charles MacGregor, and has left a family of two sons and two daughters. His death was the result of exposure and overwork during his course of service in the East. He was one of those great Anglo-Indian officers who, by their devotion to duty, their just and kind treatment of the natives, and their sympathetic intercourse with them, have been most effective agents in securing for our rule in India its present popularity and stability.

Pelly, General Sir Lewis, K.C.B., K.C.S.I., M.P.—Sir Lewis Pelly, after an honourable career of forty years spent in the service of the Indian Government and some years of Parliamentary life at home, died at Falmouth on the 22nd of April last. A tribute in our pages is due to his memory on account of contributions made to our knowledge of Eastern geography, as well as for two long and most daring journeys which he made through regions of which, at the time, very little was known. The first was a ride of 800 miles from Teheran to India by way of Herat and Kandahar, at a time when Afghanistan was in a very disturbed state, and its fierce tribes bore us but scanty goodwill. He, nevertheless, boldly pursued his way through their midst without any escort and under no disguise, but openly wearing the uniform of a British officer. The other journey, that which he made to Riyadh in 1865, when he held the post of Political Agent at Bushire, on the Persian Gulf, was perhaps still more daring and hazardous. Riyadh, situated in the heart of Arabia, is the capital of the Wahabis, the most fanatical and dangerous of all the Mohammedan sects. He reached it after a march of fifteen days through burning sands, and, having had several interviews with the Wahabi Chief, proposed to return to the coast. But it was not the intention of the Riyadh fanatics that he should ever leave their stronghold alive, and it was only by a stratagem, boldly conceived and cleverly executed, that he effected his own escape and that of his retinue.

We can only give a very brief summary of the main incidents of his career. He sprang from a family of position in Gloucestershire, was educated at Rugby, and in 1841, when only sixteen years of age, received a commission in the Indian Army. He was posted to a Bombay native infantry regiment, and eleven years subsequently was transferred to civil employment in Sindh. In 1856 he became captain, and was then appointed personal assistant to General John Jacob, and afterwards political assistant to Sir James Outram. He accompanied the former officer to the Persian War, and, after peace had been concluded, became Secretary of Legation at Teheran, and thereafter Chargé d'Affaires, when his relative Sir Henry Rawlinson retired. In 1861 he was sent to act as consul on the East Coast of Africa, and the following year was appointed Political Agent at Bushire. He held this post for eleven years, and was then employed in Rajputana as Agent to the Governor-General. His next appointment, that of Special Commissioner at Baroda, brought him very prominently into public notice, for, while he held it, the Chief of that state, the Marathi Gaikwar, was tried for misgovernment, deposed and exiled, and Pelly thereafter assumed the direct management

of affairs at Baroda. A year or two afterwards he returned to England. He had not, however, yet done with India, for Lord Lytton, when appointed Viceroy, made a special request that he might be accompanied by Pelly. On his final return to this country he took to politics, and having stood as candidate for North Hackney, in the Conservative interest, carried that constituency, and represented it till his death. In Parliament he rendered much useful service both to his party and to his county.

SANDEMAN, Colonel Sir ROBERT GROVES, K.C.S.I.—The British capacity for governing other races has perhaps been nowhere better exemplified than on that great theatre of political and military activity, the Northern frontiers of our Indian Empire. It was there that Sir Robert Sandeman, like his contemporaries, Dr. Bellew and Sir Lewis Pelly, rose to high and well-earned distinction. He entered the Indian Army in 1856; and as the great Mutiny broke out in the year following, he had not long to wait for an opportunity of distinguishing himself in active warfare. In 1859 he was posted to the Punjab, and was employed for the next sixteen years in the administration of various districts on its frontiers. He was next sent to Khelat, in Beluchistan, and having been subsequently appointed the Political Agent for that province, he governed it with conspicuous success until the end of his life. The whole country, before his advent, had been in a state of chronic civil warfare, but, by the straightforward and energetic line of action which he resolutely pursued, he effected its pacification, and that without the aid of an armed force. To adopt the words of a writer in *The Times*, "he gradually transformed a land of predatory war-like tribes, who warred against each other and knew no master, into a country of law and order, with much security for life and property." He rendered important services to Geography by the extensive explorations made in various unknown, or but little known, parts of the spacious regions under his administration. In private life Sir Robert was a man of unassuming and courteous manners. He died under an attack of pneumonia, at Lusbeyla, on the 29th of January last.

STAIRS, Captain WILLIAM GRANT.—Captain Stairs, who won for himself high distinction as an officer of the Emin Relief Expedition, and as one of the most intrepid of African explorers, was cut off in June last at the Chinde mouth of the Zambesi River. He was born at Halifax, in Nova Scotia, and belonged to a family of considerable distinction which had long been settled in that colony. He was sent, when a boy of twelve, to Edinburgh to be educated at Merchiston Castle School, and having remained there for some three years, was transferred to Ontario, to be professionally educated at the Royal Military College, Kingston. Having qualified as a Civil Engineer, he proceeded to New Zealand, where, being employed in surveying, he had his first experience of life under canvas. While thus engaged he received a telegram from the War Office offering him a commission in the Army on condition of his passing the requisite examinations. He quickly

qualified himself at Chatham, and in June 1885 was gazetted a lieutenant in the Royal Engineers. The routine of military duty in time of peace is dull and irksome to "quick bosoms," and Stairs found it all but unbearable. He longed for enterprise, for some sphere of action in which all his pent-up energies would be called into full play; when, therefore, he learned that Stanley was organising his expedition for the relief of Emin, he sent him a letter applying for a post on his staff, and he was at once accepted. To Stanley's experienced eye the letter revealed at a glance the character of its writer. The incidents of the famous expedition have been told by the leader himself in a thrilling narrative which is still so fresh in the public memory that we need scarcely remind our readers of the emphatic terms in which he has repeatedly borne testimony to the high merits of Lieutenant Stairs, his loyalty to duty, his valour and patient endurance of suffering, his quick intelligence, his resource in difficulties, and his unflagging energy. To him were assigned not a few of the tasks involving the highest degree of responsibility. Thus, it was he who was left in charge of Fort Bodo, when Stanley himself went back through the forests to find the rear column, and it was to him also that the important charge of the exploration of Ruwenzori was committed.

Lieutenant Stairs, on returning to England in 1890, was appointed adjutant to the Engineers at Aldershot, and in the following year transferred into a regiment of the line with the rank of captain. It was not long, however, before he again left this country to traverse once more the wilds of Africa, his services having been engaged by the Belgian Katanga Company to conduct an expedition to the south-eastern regions of the Congo Free State. With this expedition he started from the east coast of Africa early in July 1891, and, having reached Lake Tanganyika by the trade route, crossed to the further shore, and marched rapidly forward to the Luapula river and thence to Katanga, which he reached in safety, although the rains had set in, and his route had lain through the swampy regions in which the Congo has its sources. He found the country in a very disturbed state, and therefore led the expedition towards the coast by the Shiré and Zambesi rivers. He had finished his journey, and was waiting for a ship to take him to Zanzibar, when an attack of malarious fever prematurely closed his useful and noble career.

Freeman, Edward Augustus, M.A., Hon. D.C.L., LL.D.—By the death of Professor Freeman, who was carried off somewhat suddenly by an attack of small-pox at Alicante, in Spain, on the 16th of March last, England has lost, not only one of her greatest historical writers, but one who, by giving a new impetus and a new direction to the study of the past, may be called the founder of a new School of History. He was the son of Mr. J. Freeman of Pedmore Hall, Worcester, and was born at Harborne, in Staffordshire, in 1823. He received the university part of his education at Trinity College, Oxford, of which he became a Fellow in 1845, and an Honorary Fellow in 1880. In 1884 he was appointed Regius Professor of History at Oxford, and held that office till the close of his life. In the earlier part of his literary career he was a regular contributor to the pages of the *Saturday Review*, and among the most

attractive and memorable of his articles were those in which he described some old town or city of historic interest. He wrote at the same time contributions of greater length to some of the leading *Reviews*, and these were afterwards republished in several volumes under the title of *Historical Essays*. The first works which he published in a separate form were devoted to architectural subjects. Those which followed were chiefly historical, and were so numerous that we cannot here cite their titles. The best known among them is his *History of the Norman Conquest*, which was given to the world in five volumes, between 1867 and 1876, and his treatment of the subject was completed by the *History of the Reign of William Rufus and the Accession of Henry I.* As he desired to be scrupulously exact in all his statements, he made it a point to visit, if possible, the scenes of the transactions which his pen had to record, and his works thus abound with geographical descriptions alike valuable and interesting. He wrote, besides, a special work on geography, entitled *The Historical Geography of Europe*. Here he began with the Homeric age, and traced the successive changes the map of Europe has undergone from that remote era down to our own times.

Dr. Freeman was a very clear and forcible writer; but as he aimed less at brilliancy of style than at precision in stating the results of his researches, his productions have not had the same power of fascination for the general reader as those of Macaulay. He was inferior also to Macaulay as a literary artist; for his *Histories* are not only projected on too vast a scale, but fashioned without proper regard to symmetry, events of comparative insignificance being accorded an amplitude of treatment due only to those of far greater intrinsic importance. It has thus been said of him that he lost himself in the immensity of his materials. His merits and defects are all alike conspicuous in his last great work, *The History of Sicily*, which, unfortunately, he did not live to complete. The three large volumes which have appeared only carry down the history of the island to the Athenian siege and the tyranny of Dionysius. In politics Dr. Freeman was a Liberal, and, like Mill and Morley, sought to enter Parliament in that interest after his literary fame had been established, but he did not, like them, find a seat.

MacGregor, Mr. John, M.A.—Mr. John MacGregor, who has delighted so many readers with the bright and humorous descriptions of his voyages made in the *Rob Roy* yawl and canoe, was the son of General Sir D. MacGregor, and was born at Gravesend in the beginning of the year 1825. Only a few weeks afterwards he met with a misadventure at sea, for, with his father and mother, he was on board the *Kent*, East Indiaman, which was destroyed by fire in the Bay of Biscay. During his boyhood he was taken about from place to place with the regiment in which his father served, and his education was thus of a desultory nature until he began his university career. He studied first at Trinity College, Dublin, and afterwards at Trinity College, Cambridge, where he took his degree and passed as a wrangler. A prominent element in his character was a passion for travelling, and this he freely indulged through most of his life. After leaving college he visited many countries of the Old

World, and, among others, Russia, Palestine, Egypt, Tunis, and Algeria. He was in Paris during the stormy period of the Revolution of 1848. In the preceding year he had entered the Inner Temple, and in 1851 he was called to the Bar. He then paid a visit to the New World, which resulted in a work descriptive of what he had seen in the course of his travels through the United States and Canada. In 1866 he rose to fame as an attractive writer by the publication of his volume entitled *A Thousand Miles in the Rob Roy Canoe on the Rivers and Lakes of Europe.* The works of a similar nature which he afterwards gave to the world stand equally high in popular esteem. His *Rob Roy on the Jordan*, indeed, is perhaps the best known of all his productions. We have only to add that Mr. MacGregor was a man of wide sympathies, of active benevolence, and of sterling worth of character.

M. Henri Duveyrier.—During the year that has just closed, France has had to deplore the loss of more than one of her sons who have gained distinction as travellers and explorers of unknown regions. Three such call for mention here; and first Henri Duveyrier, who, upwards of thirty years ago, proceeded to Africa to prosecute researches in the great desert lying to the south of the Atlas regions, into which no one had attempted to penetrate since the days of Barth and Richardson. He carefully noted and described the features of the countries through which his routes lay, so that those who subsequently travelled in the same parts acknowledged the rigorous exactitude, and consequent usefulness of his indications. The map, for the construction of which he had brought home the seventy-four sheets, gained for him in 1864 the great Gold Medal of the Paris Geographical Society. He left incomplete the work in which he intended to embody his travelling experiences. Only one volume of it has been published.

M. Paul Crampel, who was a man of letters with a proclivity towards philosophy, was appointed in November, 1886, by the French Minister of Public Instruction, to conduct a scientific mission into the western parts of Equatorial Africa. This mission started about three months later with M. Savorgnan de Brazza, the Commissioner-General of the French Congo territory, who appointed Crampel to the post of his private secretary. Eleven months afterwards, when Brazza was on the point of returning to France, Crampel, who was ambitious to signalise himself as an explorer, requested to be supplied with means for the equipment and conduct of an exploring expedition. Brazza assented, and instructed him to make Lastrouville, on the Ogooué, his point of departure, and to proceed thence northwards to the 2d degree of north latitude, and then to return towards the coast between the rivers Campo and Benito. Crampel accordingly made explorations in the direction indicated, and eventually made his way to the coast with a bullet in his thigh, worn out and dreadfully emaciated by the sufferings he had undergone. The results of his journey were of no small geographical importance. He ascertained a great part of the real course of the Ivindo, with three of its affluents on the left, and five on the right, and assigned to its sources their true

position. He further discovered the Jah, and correctly determined part of the course of the river Komm and several of its affluents. At the same time he rectified the Spanish charts of the river Benito, and, above all, discovered the sources of the N'Tem, which appear to be those of the river Campo. He returned to Paris in 1889. Here he conceived the ambitious design in the prosecution of which he forfeited his life. This design, to use the formula in which his friend Alis has expressed it, was *to unite along the Central Soudan our possessions of Algiers and Tunis, of the Senegal and of the Congo, and thus to found in Africa the greatest colonial empire in the world.* Of this empire, Lake Tchad was to form, as it were, the centre; and the scheme contemplated expeditions working southwards from Algiers and Tunis towards that lake, and others working northwards towards it from the Congo. Crampel, to carry out one part of this great design, was leading an expedition northwards from the Oubanghi to the lake, when he was deserted by his escort, and assassinated by a party of Musulmans, who had sprung upon him from an ambush. The news of his death was brought to Europe in a letter from his associate, M. Nebout, dated Brazzaville, the 24th July, 1891, from which it appeared that the unfortunate traveller had met his fate in the month of March of that year.

M. Joseph Martin.—This distinguished French traveller, whose explorations have much extended our knowledge of Eastern Siberia, died in May last at Marghilan, of an illness occasioned by over-fatigue, severe privations, and other hardships. He was cut off in the prime of life, for he had only reached his forty-third year. His first journey to Siberia was made in 1879, at the instance of a mining company, which engaged his services on account of his skill in mineralogy. In his second journey he traversed the unknown region included between the Lena and the Amoor, and ascertained the real courses of the Vitim and the Olekma, and of several of their affluents, which had been erroneously traced in maps. He at the same time determined the watershed which parts the basins of these two vast rivers. His numerous itineraries in parts entirely unknown were duly appreciated at St. Petersburg, and General Stubendorf, the military cartographer, used his notes for producing a correct map of the country which he had traversed. M. Martin followed the most effective plan for acquiring a real knowledge of the tribes with which he came into contact: he lived with them, followed their caravans, studied their manners, and minutely observed their distinctive racial peculiarities. On returning to France, he enriched the museums both of Paris and Lyons, by presenting each with considerable portions of his sketches and collections. The *Commission des Prix* awarded him in 1887 a gold medal for his important services. In the following year M. Martin undertook his third and last journey. His intention was now to visit those regions where China and Eastern Siberia are conterminous. In the spring of the succeeding year we find him exploring Kan-sou, visiting Pekin, and thence directing his steps towards Lan-chou. On arriving in broken-down health at Marghilan, which is in Russian territory, he was treated with unremitting care and kindness in the military hospital of that place, but he was past recovery.

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

A Meeting of the Society was held on December 15th, in the Society's Hall, when Lieut. D. S. Buist, I.S.C., read a paper on "A Ride through Persia." Colonel Dods presided, and Dr. George Smith, C.I.E., proposed the vote of thanks to the lecturer. A vote of thanks was accorded to the Chairman on the motion of Captain Hamilton Dunlop, R.N.

On December 21st, Lieut. Buist repeated his lecture in Glasgow. Mr. R. A. Robertson presided, and Dr. J. B. Russell proposed the vote of thanks to the lecturer.

On December 28th, a lecture to young people was delivered in the Society's Hall. Prof. Cargill G. Knott gave some interesting illustrations of "Life in Japan."

GEOGRAPHICAL NOTES.

By W. A. Taylor, M.A., F.R.S.E.,

Librarian, R.S.G.S.

AFRICA.

The Population of Algeria.—The census of 1891 showed that the population of this country was 4,124,732, or 307,426 more than in 1886. The number of persons living in communities—in hospitals, prisons, asylums, etc.—had decreased from 56,269 to 16,745, and Tunisians and Moors were considerably less numerous than in 1886. But all the other elements of the population—Musulmans, French, French Jews, and foreigners—had increased. The greatest absolute gain in numbers is shown by the native Musulmans, who in the five years increased from 3,264,879 to 3,559,687, or more than 9 per cent. It cannot be decided, however, how far this result is due to a more accurate estimate, rendered possible by the extension of the civil power among more remote tribes. No data can be obtained respecting the ratio of births to deaths. It would seem, indeed, that among the Musulmans of the towns death carries off more victims than the natural increase of population can replace, and that it visits the Arabs of the plains more frequently than the Berbers of the mountains, unless it be that the latter multiply more rapidly. Among the Kabyles of Jurjura there are, it is said, three births to two deaths. Constantine is the province where the native element is most prominent, while Oran is the essentially European province, Algiers occupying a middle position.

The French population is second in numbers, and during the five years made rapid strides. In 1891 the census showed that there were 287,672 inhabitants of French blood or naturalised Frenchmen, exclusive of the Jews, who were naturalised in a mass by proclamation. The increase of Frenchmen during the quinquennial period was 48,601, or more than 22 per cent. What proportion is due to the excess of births over deaths, naturalisation, and marriages between Frenchmen and foreign women, whereby the wives are added to the number of French citizens, and how far this increase must, on the other hand, be ascribed to immigration, cannot be ascertained, for the French emigration statistics give no information on the subject. It is certain, however, that the influx of French immigrants has

never been so large and constant, and that the number of those who leave Algeria to return to their native land is insignificant compared to that of the new arrivals. At any rate, it is gratifying to Frenchmen to find that the Colonials, *i.e.* Frenchmen, Jews, and foreigners of every description, are now in the proportion of 15 to 85 native Musulmans. The *Nouvelles Géographiques*, No. 10, give many other interesting particulars of the movement of population, taking each province in turn.

Senegal.—According to a census lately completed by the Governor, de Lamothe, the population of Senegal Proper, which extends from Bakel to the ocean and from the desert to Portuguese Guinea, amounts to 1,097,000 souls. The self-governing communities contain 39,000 inhabitants; the districts under the immediate control of the French administration, 51,000; protected districts, 927,000; and, lastly, districts within the French "sphere of influence," 80,000. The numbers in the last case are, of course, only approximate. 3000 Frenchmen live in the colony, and as many white men of other nationalities. The capital, St. Louis, has 20,000 inhabitants, Dakar 8700, Gorée 2000, and Rufisque 8000.

Eritrea.—Dr. Schweinfurth, in the *Verhandl. der Gesell. für Erdkunde zu Berlin*, Bd. xix. Nos. 6 and 7, expresses on the whole a favourable opinion of the capabilities and prospects of this colony. The territory under the immediate control of the Italian Government he roughly defines as lying between the parallels of 18° and 15° 30′ N. lat., and extending to the rivers Baraka and Mareb. Few countries, he remarks, of the same small area (about 23,000 square miles) exhibit such varieties of climate, soil, elevation and flora, and inhabitants so different in race, language and religion. It may, as regards physical conditions, be divided into seven regions. Along the coast lies a hot zone, the *Samkhar*, which includes the lowest ranges of hills, rising to a height of 1000 feet. To this succeeds a sub-alpine region occupied by the outlying ridges of the highlands, intersected by deep valleys, and for the most part covered with fine forest. The maximum elevation of this district is about 5900 feet. The highlands of the Italian territory, forming its northern and north-eastern extremity, have near their steep bounding slope a nearly uniform elevation of 7200 feet, with a few peaks attaining a height of 7800 to 8600 feet. To the south, in the neighbourhood of Senafe, the peaks rise to nearly 10,000 feet above the sea-level. The most northern skirt of the highlands exhibits peculiar physical characteristics, so that in the country of the Bogos and Mensa a fourth region, lying at an elevation of 4300 to 5900 feet, may be distinguished. A fifth is formed by the mountainous country of the Hababab and Maria, between the Baraka and the sea. Here the deep valley of the Lebka breaks the hitherto continuous line of the steep slope of the highlands, and the mountains group themselves in ranges more or less parallel around the Anseba and its tributaries and other rivers. The valleys to the west of the Bogos, the home of the Beni-Amer, are the sixth region, in which the vegetation is similar to that of the Egyptian Sudan and Southern Nubia, and is typical of African steppes. The seventh region embraces the islands and the coast within the limits of the most recent coral formations.

Between the mountains and the hilly country of the *Samkhar* lie many tracts beside the brooks, where fertile alluvial soil repays the labour of the cultivator even without artificial irrigation, and which may in the future produce valuable Tropical products. At present only *sorghum* and maize are grown. The climate being very warm, this district is not suited for European colonisation, and could be exploited only with the assistance of coloured labourers. Enough has already been done—in the neighbourhood of Massaua, for instance—to prove the productivity of the soil. In the highlands agriculture has been pursued for a long time past, and the

Abyssinians, had they not been constantly disturbed by pillage and civil war, would certainly have brought cultivation to a much higher degree of perfection. As it is, only a small part of the soil is utilised, and is so negligently tended that the population might certainly be doubled by the introduction of European settlers. A wonderful variety of crops might be raised in this region, and the Greeks, especially in Keren, have shown what white men can accomplish here.

The Italians have to maintain their position in Eritrea in the presence of an ever threatening enemy, and have therefore to maintain an army of 50,000 men. On the other hand, their colony has the advantages of being the nearest to Europe of the African Tropical lands, removed also at no great distance from the mother-country, of containing elevated regions almost on the coast, where Europeans can live and work, and of possessing a population which is knit together into a united nation, and promises to respond in time to the civilising efforts of the Italian Administration.

The Tana and Juba.—In 1891 Commander F. G. Dundas, in the *Kenia*, ascended the former river to its extreme navigable point, 350 miles from the coast, where he left the vessel, and marched through unexplored country to Mount Kenia, which he ascended to a height of 10,000 feet. Having then successfully carried his boat back to the sea, he went up the coast and crossed the difficult bar at the mouth of the Juba. Further progress was at that time stopped by the opposition of the Somál tribes ; but this difficulty having been overcome by Mr. E. Berkeley, of the British East Africa Company, Captain Dundas steamed up the river last July, and reached Bardera, a town of the Somál, 387 miles from the mouth. The natives, at first hostile, were conciliated by patience and tact, and one of the sheikhs accompanied the explorer on the *Kenia* to the rapids, 20 miles further up the river, where the *Welf*, the unfortunate Baron von der Decken's steamer, is still lying. The opening up of the Juba is a great event for the East Africa Company, for a large trade may be expected in the fertile Gusha district, which extends for a distance of 100 miles along the banks, and produces cotton, tobacco, and various kinds of grain.—*Colonies and India*, November 5th, 1892.

The Minerals of German East Africa.—Dr. Lieber, a geologist, who in 1891 and 1892 investigated the mineral wealth of this territory, reports that on the eastern border of the central gneiss region are to be found stratified rocks, of which the lowest layers consist of sandstones containing fossils of the Carboniferous age. Coal seams have not yet been found, and their existence could be ascertained only by deep borings. The district in question lies about 60 miles from the coast, in the mountains of Uluguru. The iron deposits of the country have been over-estimated. The natives obtain sufficient for their own use, and the metal they extract from the magnetic ore found amidst the gneiss of the Mashashi mountains is of excellent quality. Swamp ironstone was found by Lieber widely distributed in the plain of the Mukondokwa river, about a yard beneath the surface. In the mountains of Kaguru swamp-ironstone and hæmatite are smelted. Next to Unyanyembe, the richest district is the Irangi country, on the route between Tabora and Masinde. In this country malachite is also plentiful, and, in smaller quantities, in Mashashi. Copper is not worked in any part of the territory. In the mountains of Uluguru and West Ukami Dr. Lieber found extensive strata of gneiss containing graphite. The mineral is used for colouring crockery. Mica, for which there is an increasing demand, occurs in quantities that would repay the labour of extraction, and fine plates of muscovite are yielded by the pegmatite of the Mhindu mountains. In excellence and purity it equals that of Hazari Bagh in India. The salt of the Mashashi mountains is of only local importance.—*Globus*, Bd. lxii. No. 17.

AMERICA.

New Mexico.—A letter from Dr. Dods, a Member of Council, who is staying at a *ranche* about ten miles from Fort Stanton, contains some interesting details concerning the country. Crossing the plains from Kansas City, Dr. Dods was struck by the aridness of the country ; for at least 100 miles no running water was observed. The air is so dry that a dead bullock—a common object—unless eaten by wolves, shrivels up like an old glove. Not far from Fort Stanton the hills begin ; they are prettily wooded and interspersed with grassy prairies. Many of them have perfectly flat summits, 300 to 400 acres in extent, covered with fine grass, and are called in Spanish *mesas* (=tables). The sides descend steeply into cañons, often filled with fine pine trees. Large *ranches* are few and far between. Squatters build log-huts in the cañons and clear a few acres of forest to grow Indian corn ; but many of these small farms are abandoned owing to scarcity of water, and the more than usual drought of the past summer has driven away a large number of settlers.

In October Dr. Dods made an expedition in search of the ruins of Gran Quivira, supposed to lie about 120 miles to the north. This Aztec town was taken 300 years ago by a party of Spaniards, who, being afterwards attacked by a superior force, had to retreat in such haste towards the Rio Grande that they were obliged to abandon their spoil, leaving it buried in the plain, where it is supposed to be still concealed. Passing through a mining village called White Oaks to the Gallinas Springs, Dr. Dods and his companion spent seven days in the neighbourhood of the latter place, vainly searching for the ruins. At length, from information given by a Mexican, they discovered them at a distance of 27 miles from the springs. The ruins are fairly extensive, but all the buildings are roofless, and most of the walls have fallen down. A large hall, 140 feet long by 30 wide, is still standing. The masonry is of unhewn stone cemented with clay. The timber has been carried off by shepherds for firewood, but a large beam and two finely carved brackets yet remain. Numbers of skulls were unearthed, all of one type and remarkable for the flatness of the occipital bone. Some agate arrow-heads were also found, and decorated pottery is scattered over the country for miles around. It is an interesting question how the inhabitants of this ancient city obtained water, seeing that now none is to be found nearer than Gallinas Springs. Travellers have to carry tanks or barrels, and fill them when they meet with streams or springs, which, occasionally, are as much as 60 miles apart. Firewood is, however, abundant, which must surely indicate the presence of water in the subsoil. Antelopes were often seen, but on one stretch of country, 20 miles long, Dr. Dods did not meet with a single living creature—not even a bird.

The Rainfall of Jamaica.—*Symons's Monthly Meteorological Magazine* for October reports the publication of an excellent work on this subject by Mr. Maxwell Hall, Government Meteorologist. The total yearly rainfall varies in the island much as it does in Yorkshire. The wettest part of Jamaica receives about 100 inches and the driest about 30 inches, while the corresponding values for Yorkshire would probably be about 80 and 25 inches respectively. The fall seems to be fairly uniform, except in the north-east of Jamaica, where it is much heavier than in other parts, just as the fall in the north-west of Yorkshire far exceeds that of other parts of that county. Mr. Maxwell remarks in his introduction that the utility of his monthly maps is sufficiently obvious. "If the agriculturist wants constant and heavy rains, he will find them as a rule in the parishes of Portland and St. Mary ; if he wants heavy summer rains, he will find them in the west

central parts of the island ; if he wants a moderate rainfall all the year round, he will find it in the area between Chapelton and Linstead, Albion and Cave Valley."

The Lake of Yzabal in Guatemala.—Dr. Karl Sapper has communicated to *Petermanns Mitteil.* (Bd. 38, No. 10) an account of a visit to this lake. Beyond Panzos the path is unpleasant to travel on, as it is in some places very dirty, often crosses streams and small swamps, and is frequently interrupted by fallen trunks and rank vegetation. It runs to the south of the Polochic river, along the valley bottom, and is very lonesome. Only a few clearings, inhabited by a sparse population, chiefly Indian, break the continuity of the virgin forest, which, with its beautiful and varied forms, extends to the shore of the lake. The chatter of monkeys and the screaming of parrots breaks the silence, but of larger animals there is great scarcity. Dr. Sapper observed the spoor of the jaguar and tapir, and saw a few snakes. Small insects were numerous and troublesome. The lake, which is about 30 miles long by 12 broad, reminded the traveller of the Lake of Constance, as seen from Lindau or Bregenz. The charming alternation of wood and meadow, rock and snow is, however, wanting : forests clothe the mountains from the foot to the summit, and the few spots where bare rock emerges to the light are scarcely perceptible amidst the vast expanse of foliage. There are, moreover, few distinct peaks, the mountain ridges for the most part rising and falling in gentle outlines. The town of Yzabal is a very quiet place, with grass and mimosa growing in the broad straight streets, and even the jetties are desolate and forlorn, for the navigation is confined to a service of steamboats running three times a week to Livingston, and some intercourse with the other settlements on the bank of the lake by rowing and sailing boats. Yet the lake, though shallow and wanting good harbours, must considerably facilitate communication between the settlements on its shores, and it is connected with the sea by the navigable Rio Dulce, while the Polichic also is navigable for some distance. The present stagnation of trade in this neighbourhood is due to the smallness of the population. The cruelties of the early Spanish invaders caused the depopulation of the country, and now, Dr. Sapper believes, towns and large plantations will probably never spring up here, for malarial fever would soon work havoc among European settlers. The only reputation it is likely to acquire is for beauty of scenery. Exquisite views may be obtained from the hills surrounding the lake, and the voyage on the Rio Dulce surpasses, in the loveliness of the river banks and the luxuriance of their vegetation, the most sanguine expectations. The ruins of the Indian town of Quirigua are also of great interest.

The Araguaya and the Lower Tocantins.—The waters of Central and Northern Goyaz and of Western Matto Grosso collect into two mighty rivers, which, uniting at 5° 21′ S. lat., descend the northern slope of the vast plateau of Central Brazil in a series of rapids. Of these the Tocantins, though smaller than the Araguaya, has gained the credit of being the main stream, and gives its name to the united river. Though it was discovered by Europeans nearly two centuries ago, the Araguaya is still one of the least known rivers of South America. The first partial survey, taken by the great Castelnau expedition of 1844, has, affirms Dr. Paul Ehrenreich, in a long article published in the *Zeitschrift der Gesell. für Erdkunde zu Berlin*, Bd. xxvii. No. 2, contributed to a thoroughly false representation of this region in maps. Added to this, in many later maps, such as that in *Stieler's Hand-Atlas*, S. João das duas Barras, at the confluence of the rivers, the only place the position of which was ascertained by Castelnau with some degree of accuracy, is displaced considerably to the north, and the Lower Tocantins is thereby shortened.

The course of the Araguaya-Tocantins falls naturally into four divisions. The first extends from the source to Itacayu, where commences the middle course,

navigable at all seasons of the year, which terminates at the rapids of S. Maria. Then follows a region of rapids extending to Praia Grande ; and, finally, the estuary, exposed to the tide of the Atlantic and navigable by large steamers. Three streams unite to form the river, the Cayapo Grande, the Caposinho or Rio Bonito, and the Rio dos Barreiros, of which the first is held to be the chief. Its direction is certainly from west to east. From a large cataract, a short distance below Registro de Matto Grosso, the river runs in a northerly or north-easterly direction to Itacayu, where it makes a gradual bend to the south-east until it reaches the confluence of the Rio Vermelho and the Goyaz port, S. Leopoldina. Here it is 574 yards broad in August and 15½ feet deep. Below S. Leopoldina the Araguaya flows for a distance of six degrees of latitude through perfectly flat alluvial country. Its bed is filled with numerous islands submerged during the rains, and lagoons communicating with the river by narrow *furos* abound on both banks. These, being invariably crescent-shaped, are no doubt silted-up bends of the river. In recent maps the river is represented as running in a north-easterly direction as far as the mouth of the Crixas, and then making a sudden turn to the north-north-west—a caprice not to be expected in a plain where rocks are absent. The fact is, that the Araguaya during this part of its course flows due north, with only unimportant deviations at first to the north-north-east and afterwards to the north-north-west. The most remarkable hydrographic formation of the Araguaya is the island of Bananal or Santa Anna. A little below the mouth of the Crixas the river divides into two arms, which unite again at about the tenth parallel of south latitude. The island thus enclosed has, according to Cunha Mattos, a length of about 250 miles and a maximum breadth of about 180 ; it is quite flat, and contains near the northern extremity a large lake, which is drained by a stream running into the eastern arm of the river. Last century an unsuccessful attempt was made to colonise the island : it is now inhabited by the Karaya tribe of the Yavahe. Into the left branch of the river enter the most important tributaries of this part of the Araguaya, namely, the Cristallino, the Rio das Mortes, and the Tapirape : the Rio Alagado, given on our maps, does not exist. The Rio das Mortes, the largest of all the tributaries of the Araguaya, joins the main stream about 80 miles below the Cristallino. Though it has several times been navigated, its course is still but little known. Its parent stream is believed to be the Rio Manso, which crosses the road to Sangradouro about 75 miles from Cuyaba. The Rio Tapirape flows through several small mouths into the Araguaya about 116 miles lower down, and not at the northern extremity of the island, which is 85 miles further. Here large elevations appear for the first time : a twin-peaked mountain, about 1000 feet high, extends its spurs to the bank, and, with another elevation on the opposite, right, bank, forms the narrows known as the Feixo dos Morros. Immediately beyond the northern extremity of the island of Bananal the river forms a smaller island, which, in turn, is succeeded by the larger Ilha de S. Maria. Turning then to the north-east, it arrives by the small Ilha de Santa Anna at the first impediment, a barrier of rock that bars the way to steamers, except at very high water. Before it is reached the lofty Serra dos Cayapos (a name given on maps to a range much further south), which is still entirely unexplored, appears on the left, running from south to north, while other chains are visible in the distance both on the western and eastern side, and further to the north lies the still higher Serra de S. Maria Velha. The *Travessões*, or rocky barriers, are formed by the spurs of these ranges, and are the steps by which the river gradually descends from the plateau. After several less important narrows, rapids, and whirlpools, the rapids proper begin with the Secco de S. Miguel. In the first series, 18 miles in length, and ending with the Carreira Comprida, the river falls a vertical height

of 83½ feet, or 4 feet 7 inches to a mile. The velocity of the water in the Carreira Comprida varies from about 3½ to 4½ feet per second. The channel then becomes narrower, and the river runs northwards with a velocity less than 2½ feet per second, but increasing when the water is high to 7¾ feet, past Martirios Island to the Cachoeira Grande, 6 miles below the island. This succession of rapids stretches a distance of 6½ miles, to the mouth of the Ribeirão da Providencia, during which the river falls 52 feet, or at the rate of 8 feet per mile. Dr. Ehrenreich descended these rapids, rather over 12 miles long, in one hour, whereas in ascending fourteen days are required by large boats, and six to eight by smaller ones. Below the river presents no obstacles to navigation until São Vincente is reached, where the stream turns round almost to west-north-west, and again forms rapids and whirlpools all the way to the mouth of the Tacaiunas. This river, the most considerable tributary of the Lower Tocantins, is hardly known at all. It has been ascended to a distance of 65 miles, when a large cataract was found 8 miles from the mouth. From the statements of the Cayapo Indians it seems probable that its source lies in the neighbourhood of the Serra dos Cayapos, in about 9° S. lat. Below its mouth the Tocantins flows, with moderate velocity, along a bed 180 yards broad, between lofty wooded ranges, to the next cataracts, which commence at Tauiri. Here the river falls, in two series of rapids, 18 feet in 5 miles, or about 3½ feet to a mile. Some leagues further down-stream the river divides into several channels, the principal of which is the Itaboca, and by the time it reaches the upper end of the Ilha da Piteira has fallen 112 feet in about 11 miles, or over 10 feet to a mile. It may be estimated that the total fall of the river in the region of cascades is about 390 feet. From the settlement of Alobaça the banks become lower: the river has crossed the edge of the plateau, and now enters the broad estuary filled with innumerable islands.

The whole basin of the Araguaya proper lies in the zone of prairies, which stretch with only slight differences of character from the Tropic to the Equator. In the region of the cataracts the woods are most luxuriant, and here a large variety of useful timber can be obtained. The first form characteristic of the vegetation of the Amazons, the Javary palm, appears at lat. 9° S., and at San Vincente a few Assai palms are found, and also Brazil nuts (*Bertholletia excelsa*), which, from S. João downwards, form large forests and furnish the chief article of export. In the alluvial lands below Alobaça grows the india-rubber tree (*Siphonia elastica*), covering the innumerable islands between Baião and Cameta. Here also palms of numerous varieties help to form the character of the landscape. Sugar, cotton, and tobacco thrive along the Araguaya, oranges run wild near the settlements, and in some few places cocoa is grown. The white population is small, nor does it show any signs of increasing. The chief occupation is grazing, and agriculture makes hardly any progress. The native tribes, on the other hand, are numerous, and many of them, even after a century's contact with Europeans, preserve their primitive customs, so that they present many peculiarities interesting to the ethnographer. The Antas, who have not yet been visited by travellers, are said to be still in their stone age.

Chile.—In August last Dr. Steffen spoke before the German Scientific Association in Santiago on the hydrography of the provinces of Valdivia and Llanquihue, in Southern Chile. He dwelt particularly on the source-region of the Calle-Calle, explored in 1887 by the expedition sent out under the command of Fernandez Vial, the results of which have not yet been published. The most western source of the Calle-Calle, the Lake Lajara, is erroneously marked on many maps as lying in Argentine territory, whereas the nearest Argentinian frontier fort,

Maipu, lies on a feeder of the lake which flows from the east. To the north the lake discharges its waters into the long narrow Lago Pirehuaico, which is connected by a channel running westward with the Lago Panguipulli. From the latter the Rio Shoshuenco emerges, and, running through the Lago Riñihue, becomes the Calle-Calle. The watershed between the Rio Trancura, which feeds the lake of Villarica, and the Rio Alumine on the Argentine side passes over the volcano Lañin. Lastly, Dr. Siemiradzki, who visited the district a short time ago, has stated that the lake Nahuel-Huapi, which is usually represented on modern maps as a sheet of water running from north-west to south-east, is more correctly delineated on older maps, based on the observations of Chilian expeditions.—*Globus*, Bd. lxii., No. 16.

AUSTRALASIA.

German New Guinea.—From the *Nachrichten über Kaiser Wilhelms-Land und den Bismarck-Archipel*, of which the first *Heft* for this year has lately come to hand, we gather a gloomy impression of the Berlin New Guinea Company's affairs. The stations of Hatzfeldthafen, Finschhafen, and Butaueng have been finally abandoned—the first owing partly to the hostility of the natives, partly to the comparative unfitness of the soil for tobacco-planting. The headquarters of the Company are for the future to be at Friedrich Wilhelmshafen. The planting of cotton, tobacco, and coco-nuts is, however, proceeding actively. Influenza of a severe type seems to have been prevalent among both whites and natives. Herr Schmiele institutes a comparison between Kaiser Wilhelms-Land on the one hand and the islands of Java, Sumatra, and Ceylon on the other, asserting that the former excels all the others in fertility of soil, climate, natural harbours, etc. But he draws a much more practical comparison between Kaiser Wilhelms-Land and the Bismarck Archipelago. The soil of the former, he says, is far richer, and the land intrinsically more valuable. But owing to the expense of clearing the dense bush, the climate, and the backward and unfriendly character of the people, it can only be exploited to a profit by raising the more valuable class of products, with a large expenditure of capital. New Britain and New Ireland, on the other hand, have a more insular climate. The undergrowth is thinner and the soil lighter, and deep accumulations of soil are prevented by the heavy rains. The climate is healthier, and the natives very accessible to trade, so that planters and traders on a small scale can live and flourish there.

MISCELLANEOUS.

An Italian **Meteorological Station** has been established in **Tripoli**.—*Cosmos*, vol. xi. No. iv.

M. Monteil arrived on October 17th at Tegerri in Fezzan, to the south of Murzuk, whence he intended to proceed to Tripoli. From Kano (*S.G.M.* vol. viii. p. 384) he marched to Kuka on Lake Tsad.

At a meeting of the Royal Geographical Society, held on November 28th, **Mr. Joseph Thomson** gave a narrative of his journey across the Loangwa-Kafue plateau to Chitambo and the village of the Iramba chief, Msiri.

Mr. Fred. W. W. Howell, who ascended the **Öræfa Jokull** in South Iceland in the summer of 1891, found that the highest of its three peaks rose to an elevation of 6400 feet, while the Knappr, lying more to the south, was only 5860 feet in height.—*Proceedings of the R.G.S.*, December 1892.

Mr. Theodore Bent is about to explore the ruined city of **Axum** in Abyssinia, which was of great importance in the latter centuries before the Christian era. It formed part of the Ethiopian kingdom which had Meroe for its capital, and was ruled by queens bearing the hereditary title of Candace.—*Colonies and India*, December 3, 1892.

Captain Bottego, with 100 *Askari*, left Massaua for Berbera on September 21st, with the intention of penetrating to Ogaden and, perhaps, to the oasis of Faf. **Captain Ferrandi**, ascending the Juba, will advance by the northern arm of that river to the country of the Borani Galla, and will endeavour to meet Captain Bottego.—*Boll. della Soc. Africana d'Italia*, July-October 1892.

Hauptmann von François has imported **dromedaries into German South-west Africa**, where they are successfully employed in the postal service between Windhoek and Walvisch Bay. With a load of 250 pounds they travel at the rate of about 2½ miles per hour, and march, between Lehuititang and Ganab, six days without water. They do not become sore-footed in stony country like unshod horses and oxen.—*Globus*, Bd. lxii. No. 19.

NEW BOOKS.

The Career of Columbus. By CHARLES I. ELTON, F.S.A. With map. London: Cassell and Co. (Limited), 1892. Pp. xii+307.

The World's Great Explorers: Life of Columbus. By CLEMENTS R. MARKHAM, C.B. London: George Philip and Son, 1892. Pp. 375.

The Story of the Discovery of the New World by Columbus. Compiled from accepted authorities. By FREDERICK SAUNDERS, Librarian of the Astor Library. London: Elliot Stock, 1892. Pp. 145.

It was inevitable that the celebration of the fourth centenary of Columbus's first voyage to America should produce, among other things, a flood of literature bearing on the life and work of the Genoese navigator. The books at the head of this notice are samples of the different kinds of contributions which the occasion has called forth. They differ both in plan and in aim. Mr. Clements Markham's *Life of Columbus* is a plain and straightforward narrative of the career of the Admiral, written with graphic power and with full knowledge. The aim of Mr. C. I. Elton is not so much to tell the story of the discovery of America, or to debate the evidence about the disputed points in the biography of Columbus, as to illustrate his character. The only matter of abiding interest, in his view, is "the consideration of the inward man." His work is, therefore, the more ambitious in design and the more learned in treatment. His object has been to trace the influences which made Columbus what he was as a man and as an explorer. He describes his surroundings at Genoa, at Pavia, at Lisbon, at Salamanca, and at Santa Fé. He describes also his early voyages, the difficulties with which he had to contend, the dangers he incurred, his preparation for his first great voyage across the Atlantic, his conduct during the voyage, all in their bearing on the inward man—that is to say, as opportunities for exhibiting his characteristics—rather than in their bearing on historical or geographical knowledge. In working out this scheme Mr. Elton has shown considerable skill. The chief fault of his work is that it is somewhat too gushing and rhapsodical. His pages are overlaid with allusions more or less recondite, and bristle with Italian and Spanish names which are too likely to prove "caviare to the general," and which, being for the most part unnecessary, form a distinct barrier to the enjoyment of his book by

ordinary readers. Mr. Clements Markham has avoided these mistakes. His pages are pleasant reading, because of the simplicity and directness of his style. There is nothing in them that cannot be readily understood. The narrative flows on easily from year to year, and from incident to incident. He has also been more careful than Mr. Elton in testing the accuracy of the statements of the older biographers and geographers regarding Columbus's family and early life. Mr. Elton, following Fernando Columbus and Las Casas implicitly, tells us that Columbus's wife, Philippa Moniz, was the daughter of Isabel Moniz and Bartolomew Perestrello, and that on the death of the latter, in 1457, he bequeathed to his daughter a plantation on his island of Porto Santo. These statements have been repeated by nearly all the succeeding biographers of Columbus, including Washington Irving, who, however, goes a step further than the others when he says that the name of Perestrello was "Bartolomew Moniz de Perestrello." Now, if that had been the parentage of Columbus's wife, obviously her name would ave been not Philippa Moniz but Philippa Perestrello. Mr. Elton adds that Philippa's grandfather, "Gil Moniz, had endowed a chapel and vault in the Carmellite Monastery, and it was clear that no one out of his direct line was entitled to use the vault." When Philippa died, however, she was buried there (at least for a time), and if she had been a Perestrello it is very doubtful whether her body could have been admitted there. However this may be, Mr. Markham shows very clearly that this whole account of the family of Moniz is wrong. Isabel Moniz, the wife of Perestrello, was not the mother but the aunt of Philippa Moniz, and therefore the latter was not a Perestrello at all. She was the daughter of a son of Gil Moniz, whose name has not been preserved. Mr. Markham has the authority of Fructuso and the Portuguese genealogists for saying that Bartolomew Perestrello had an only child by Isabel, his second wife, who was named Bartolomew after his father; and that on the death of her husband, in 1457, Isabel gave up her rights in Porto Santo and returned to Lisbon. Thereafter the island was governed by her step-son-in-law Pedro Correa, till 1473, when the younger Bartolomew Perestrello obtained the government, to which his birth entitled him. With the explosion of this Perestrello story, which seems to have originated in the confused statements of Fernando Columbus, a whole mass of fiction falls to the ground. All the fine stories repeated by Mr. Elton about Philippa spending her childhood on the lonely island of Porto Santo, and telling many tales of these times, of Columbus and his wife going to live with his "mother-in-law," Isabel at Lisbon, of this same "mother-in-law" telling him exciting stories of the adventures of Perestrello at sea, and showing him his maps and papers, and of Columbus returning to Porto Santo with his wife and her mother and spending several years on the island "of which his own brother-in-law was the new governor, and in which his wife was the owner of a plantation," are bound to disappear, when the statement on which they all hang is proved to be destitute of foundation. Another incident on which Mr. Elton expatiates with gusto is that of Columbus having been sent to Tunis by King René of Provence to capture the galleass "Fernandina," connected with which there is the story of Columbus having changed the compass-card in order to deceive his sailors as to the course he was sailing. Mr. Markham shows that, according to the best authorities, Columbus must have been exactly thirteen years of age when this important duty was intrusted to him. Even if we adopt the earliest date assigned as that of the birth of Columbus, he would be only twenty-four, and there are legal documents which prove that, twelve years after the event, Columbus was described as a weaver of Genoa. On all the main incidents in the life of Columbus Mr. Markham will be found a trustworthy guide. He carefully sifts the evidence on doubtful points and draws his conclusions with sound judgment. He is rational,

and not rhapsodical; and what his narrative lacks in picturesqueness it gains in accuracy. His book contains five excellent portraits of Columbus and twelve other illustrations. It also contains seventeen admirable maps, eight of them printed in colours, and is furnished with an exhaustive index. This is not only a valuable addition to the series of "The World's Great Explorers," to which it belongs, but it deserves to be regarded as a standard Life of Columbus.

The third volume on our list, written by the librarian of the Astor Library, New York, does not possess any very striking feature. It is for the most part a compilation, Washington Irving, Prescott, and other writers being laid under frequent contribution. The confused account which these writers give of the relationship of the wife of Columbus to the Perestrello (not Palestrello) family is repeated without a suspicion of its inaccuracy. Mr. Saunders is inspired with intense admiration of his hero, but he writes in curiously stilted English, and he too often sacrifices perspicuity to verbose effect. Like the illustrations, the style of the book is somewhat theatrical. This is the English edition of a book printed in America.

Castorologia, or the History and Traditions of the Canadian Beaver. By Horace T. Martin, F.Z.S. 8vo. London: Stanford; and Montreal: Drysdale. xvi + 238 pp., 54 Illustrations.

This work, which is described on the title-page as an "exhaustive monograph, popularly written and fully illustrated," is perhaps the last book which will be written on the beaver, for this interesting creature seems doomed to speedy extinction—a victim to human carelessness and greed. It lingers here and there in Europe; skins from Siberia are scanty; in the United States its numbers are dwindling rapidly; and as for Canada, Mr. Martin holds out no hope of its prolonged existence. "The question is only one of a few years at most, and before this century closes we may find the last survivors within the railed enclosure of some zoological garden." This is a pity, and we can hardly expect that our successors will regard even "an exhaustive monograph" as sufficient compensation for the loss of the living creature. Perhaps, however, we may hope that Mr. Martin's interesting study may do something to awaken responsibility before it is too late. The author has done his work well, for although naturalists will find more details in Mr. Lewis Morgan's well-known book on *The American Beaver*, the volume before us is what a monograph of a decadent species ought to be—truthful, loving, and with a wide horizon. He tells of beaver folk-lore and of the lies of the wonder-mongers, of the formerly wide distribution and its gradual narrowing towards a vanishing point, of the life-history of the animal and how it has entered into human history, and much more besides. The illustrations of the true and the false beaver are delightful; style and typography are pleasant; in short, the book is worthy of its subject. We must express our admiration of the manner in which poetic feeling is conserved without endangering scientific accuracy, for while Mr. Martin brushes aside many popular illusions—which have become almost traditional—he leaves the story of "the national totem" a subject of legitimate wonder. In 1771, the accurate observer, Samuel Hearne, wrote ironically that the only thing that remained to make the natural history of beavers complete was "a vocabulary of their language, a code of their laws, and a sketch of their religion;" this Mr. Martin does not, of course, supply, but he has written their eulogy. It is to be feared that he will soon have to write their epitaph.

Nomina Geographica. Sprach- und Sach-Erklärung von 42,000 geographischen Namen aller Erdräume. Von Dr. J. J. Egli. Zweite, vermehrte und verbesserte Auflage. Lfg. 2-6 (Anhanhecanhuba—Salt). Leipzig : Friedrich Brandstetter, 1892. Pp. xli. + 648.

These further instalments of Dr. Egli's book, completing about two-thirds of the whole, enable us to form a better judgment of its scope and method of treatment than we could from the single number we noticed on p. 393 of vol. viii. It is much more than a purely etymological dictionary of geographical names. Dr. Egli's plan includes the treatment of such general epithets as Black, Long, New, and so forth, and their corresponding equivalents in the principal geographical languages ; and besides these common terms, he gives separate articles to all, or nearly all, those navigators whose names have been utilised in geographical nomenclature—*e.g.*, Baffin, Cook, M'Clintock, Livingstone. The information given under these latter headings is generally encyclopædic in character, embracing a brief summary of the principal moments in the explorer's or navigator's career as a discoverer. The author has adopted a practice throughout which cannot be sufficiently praised in a work of this kind : he gives everywhere the names of his authorities, with precise references, and as a general rule quotes the *ipsissima verba*, no matter what the language may be in which the passage is written. This is one of the most admirable features of the work. Another is that Dr. Egli has not always felt it incumbent upon him to decide which, out of alternative explanations that have been put forward, is the only correct one ; we have noticed several cases where he contents himself with stating the rival theories, sometimes with, sometimes without, a remark indicative of his own preference ; but nowhere have we observed a passage in which he can be accused of making a rash, dogmatic assertion or an arbitrary assumption. Nevertheless, we do not, we confess, understand the principles Dr. Egli has gone upon in making his selection of words ; for whilst we find articles on Banjermassing, Makassar, Applecross, we fail to find Banca, Billiton (Blitong), Kei (Ke), Durham, and Ely. Moreover, we should almost have expected that names like Cathay, Holmgard, Karakorum, Dorstad, and other place-names, which though obsolete in geography are still not uncommon in history, would have a place. Amongst other modern names, the absence of which has struck our attention, are Jarrow, Godwin-Austen, Boro-Budur ; and doubtless there are many others—for, of course, the line must be drawn somewhere. When treating of Holland, however, it would assuredly not have been out of place to allude to Holland, one of the divisions of the English county of Lincolnshire ; that would have led, as a matter of course, to the inclusion of Kesteven and Lindsey. Under Arthur's Seat, the legendary connection of the mountain with the ancient hero of the Round Table deserved mention, to say the least. The "Glazier controversy" is not alluded to under either Itasca or Mississippi. Libourne derives its name from an English knight, Leyburn or Lilburne, who was connected, if we remember rightly, with its founding in the middle of the thirteenth century. Typical instances of Dr. Egli's prudent suspense of judgment will be found under Belt, Galicia, Galloway, London, Liverpool. The book is so full of precise and detailed information, and affords so many topics of an interesting character, that one would never know where to stop if once launched on the discussion of individual points. It must suffice to repeat that the book fully deserves, nay, demands, the attention of students interested in that important but too much neglected branch of geographical science—nomenclature.

Medum. By W. M. Flinders Petrie. London: David Nutt, Strand, 1892. Pp. 50, Index, Frontispiece, and 36 Plates.

Mr. Flinders Petrie, the well-known Egyptologist, has rendered another service to science by publishing this interesting and splendid work. It is an exceedingly careful description of the pyramid and cemetery of Medum. The pyramid is believed to be the oldest known building in the world, and some of the chambers, except for slight weathering, are still as perfect as they were when Egypt was almost bare of monuments.

We must refer our readers to the book itself for details respecting the pyramid and temple, the *mastabas* and burials, the sculptured chambers and early hieroglyphics. Some of the bodies were found to be mutilated; in one instance, the whole left leg was missing from the knee, and as the end of the bone did not show any change in the joint surface, the amputation must have been made shortly before death; in another case the left hand appeared to have been cut off, and here also the arm-bones were not fallen or displaced, so that the hand must have been severed in life. In one case a toe bone was found underneath the pelvis. Such curious displacements of bones in only thirteen skeletons show that much care must be in future spent in fixing the positions of the displaced bones; but in order to clear up the questions involved further research is needed. Some of the small antiquities found in the tombs belong to the fourth dynasty, and some of the chambers could not have been touched since the eighteenth. The inscriptions on the walls were of Tahutmes III. and Amenhotep III., as well as of Seneferu. A chapter on the inscriptions is written by F. Ll. Griffith; one on the varieties of ancient *kohl*, by Dr. A. Wiedermann; Egyptian colours are treated of by Dr. W. J. Russell; and the Coptic papyri by W. E. Crum. The illustrations, which are all to a definite scale, have been reproduced by photo-lithography, and are of the greatest interest and importance.

Paddles and Politics down the Danube. By Poultney Bigelow, 1892. London: Cassell and Co. Pp. 253. *Price* 3*s.* 6*d.*

Mr. Bigelow and two other Americans started, in June 1891, in three canoes and paddled down the Danube from its source to the sea. The trip seems to have been a most enjoyable one, and Mr. Bigelow gives a charming account of the voyage. His tiny craft was 15 feet long, 30 inches wide, 12 inches deep, and weighed 80 lbs. It had a centre-board which folded like a fan, and a rudder that was lowered when sailing, and hoisted up when paddling. The picturesque scenery on both banks between Donaueschingen, which "has been arbitrarily designated the source of the Danube," to Linz is somewhat minutely described; the course of the river through Lower Austria is, we regret, omitted; and then Hungary is reached, and the people rather than the scenery form the theme. Mr. Bigelow was delighted with the Magyars. "To have the key," he says, "to one Hungarian heart is to have the key to all. You approach them as a chance stranger; you part from them in tender friendship." The chapter entitled "A Night of Revelry near Budapest," gives an admirable picture, enthusiastically drawn, of the attractive side of Magyar life.

The most dangerous, if also the grandest, part of the Danube consists of the whirlpools and rapids terminating with the celebrated Iron Gates. This dangerous stretch of 75 miles was successfully navigated by Mr. Bigelow, who tells the tale graphically and well. He considers that the rapids of the Iron Gates are very much more difficult than those of the St. Lawrence, which he has also gone down. A deep channel along the Servian shore, through which ships may pass at all times, is now, however, being formed.

In a chapter on "The Jew from a Danubian Point of View," the author states that he was surprised to find that, in the opinion of American and English merchants whom he met in Russia, "the Czar had done but one good thing since he came to power—namely, abating the Jewish nuisance." Amidst all classes and all peoples—Poles, Russians, Hungarians, Roumanians, merchants, officials, nihilists, patriots—even among English and Americans doing business in the country, he could find no one who championed the cause of the Jew.

This instructive volume is embellished with numerous illustrations by the author, but contains no map. We trust that if it attains, as it deserves, a second edition, the author will affix a map of the course of the Danube, with the stations marked at which each night of the canoe trip was spent. It would then serve as an excellent guide to canoeists, as well as an interesting book of travel and adventure.

Historical and Descriptive Account of the Island of Cape Breton. By J. G. Bourinot, C.M.G., LL.D., D.C.L. Montreal: W. Foster, Brown, and Co., 1892. Pp. 183.

In this beautiful volume, Dr. Bourinot, President of the Royal Society of Canada, reviews the history of Cape Breton, which is situated at the southern entrance of the great river St. Lawrence. A controversy has gone on for years as to the first American land seen by Cabot and his son—whether the coast of Labrador or Newfoundland, or north-eastern cape of Cape Breton. In a map of 1544, only discovered in Germany in 1843, and attributed to Sebastian Cabot, the point marked "prima tierra vista" seems to be Cape North on Cape Breton. "England's title," says Dr. Bourinot, "came from the voyages of the Cabots." When Newfoundland became a British possession in 1713, its French officials and inhabitants removed to Cape Breton, which they named Ile Royale, with Louisbourg as its capital. In 1745, a volunteer force from New England took Louisbourg in the name of his Britannic Majesty, after a siege of forty-seven days—a glorious achievement, which Dr. Bourinot thinks has not been done sufficient justice to by British historians. He even instances a new British encyclopædia, which states that "Louisbourg was taken by the British in 1763;" the fact being that it was taken in 1745, was afterwards restored to the French, was retaken by the British in 1758, and was ultimately ceded with Cape Breton to Britain by the Treaty of Paris in 1763.

The volume is full of interesting antiquarian information, is well illustrated, and is a credit to the Canadian press.

Arthur Young's Tour in Ireland (1776-1779). Edited, with Introduction and Notes, by Arthur Wollaston Hutton, with a Bibliography by John P. Anderson, of the British Museum. 2 vols. London: George Bell and Sons, 1892. Pp. xviii + 470 and vi + 401. *Price* 7*s.*

This, the first complete reprint of *Young's Tour*, is to be welcomed for many reasons. The work has no equal in so far as it points out in an authoritative and clear manner the agricultural state of the country at the time of the visit, with a certain shrewdness in remark and conclusion, and a general attempt at fairness of view in so far as soils, crops, and other matters connected with the farm are concerned. Young had no eye for anything but the land and its productions, and dwelling and farm buildings. Beyond these he seldom strays; he has nothing to tell of antiquities, and but little of scenery and manufactures. Yet beyond their merely utilitarian purpose, these volumes have a certain interest of their own; and the various departments, as one may say, of the work have been well brought

out by a variety of types which, although not so marked as to spoil the appearance of the page, yet is sufficient to catch the eye and enable the reader to peruse whatever subject he may be most interested in, without wading through matters with which he does not wish to concern himself. The notes are, upon the whole, admirable; the editor, it is true, has not been able to identify every farm or estate mentioned, but that is not to be wondered at when place-names change so frequently as they do in Ireland. The bibliography also is excellent, and there is a good index. The volumes, it ought to be added, belong to the "Standard Library," one of Bohn's well-known series of "Libraries."

The Climate of Rome and the Roman Malaria. By Professor Tommasi-Crudeli. London: J. and A. Churchill. 1892. Pp. 163.

In 1885, the author of this book delivered a course of lectures at the inauguration of the Institute of Hygiene attached to the University of Rome. They were afterwards published under the title of *Il Clima di Roma*. The small volume before us is a translation of that work, which has been revised and corrected up to date by Professor Tommasi-Crudeli. Mr. Dick has performed his work as translator well.

Professor Tommasi-Crudeli has been long known as an authority on the subject of malaria, and, indeed, some ten years ago he discovered the micro-organism, to which the name of *bacillus malariae* was given, both in the water and in the air of the Pontine marshes, as well as in the blood of patients suffering from malaria. Although his theory that this bacillus was the cause of the disease has not been generally recognised, yet his work has been of the utmost value. He does not believe that the draining of the Pontine marshes would have any appreciable effect in modifying the hygienic conditions of Rome or of the greater portion of the Agro, for he holds that malaria is produced in Rome itself in many spots where the soil is still uncovered, or where the labour of man places it directly in contact with the air. And he proves this by referring to the malaria maps of 1870 and 1884, which show how many portions of Rome, which were malarious in 1870, have since become salubrious owing to the pavement of the streets and the erection of new buildings. The Professor's chapter on the preservation of human life in malarious countries should be read with care by all sanitarians and travellers to tropical regions. It is a pity that a few maps were not employed to illustrate the volume.

Notes for the Nile, etc. By Hardwicke D. Rawnsley, M.A. London: William Heinemann, 1892. Pp. 324. *Price* 5*s.*

These *Notes* by Mr. Rawnsley will be found interesting reading in themselves, and of service to tourists who visit Egypt and take more than a passing or sight-seeing interest in the wonderful archæological vestiges to be found there. The book concludes with a metrical rendering of the hymns of ancient Egypt and of the precepts of Ptah-Hotep, "the oldest book in the world." Mr. Rawnsley is an agreeable cicerone, and appears to be well versed in Egyptology.

Welsh Pictures: drawn with Pen and Pencil. By John Lloyd, M.A., D. Lewis Jones, B.A., Morris Jones, M.A., A. N. Palmer, E. Foulkes, O. M. Edwards, M.A., D. Tyssil Evans, M.A., L. Lenfer Thomas, B.A., Rev. H. Elvet Lewis and Rev. David Davies. Edited by Richard Lovett, M.A. With seventy-two illustrations. London: The Religious Tract Society. N.D. Pp. 192. *Price* 8*s.*

The chief fault of this volume—a fault well-nigh inseparable from a work undertaken by so many different pens—is a lack of balance. Each author, in a

book so written, must have a certain latitude allowed him, if anything resembling a satisfactory result is to be attained; and, as might be expected, some have more freely availed themselves of this liberty than others. Another matter calling for remark is the want of uniformity in the spelling of names. This also arises from the same cause, but strictness in editing might very well have reduced the spelling to a uniform system. Beyond these remarks we have nothing but praise for the book. It is a worthy successor to the previous numbers of the series, and in some ways surpasses some of them. The chapter on "Bygone Wales" is a model of clear condensation, and is perhaps the best part of the whole work. Of the illustrations it is unnecessary to speak at any length. They are all that could be desired, and for beauty of execution are a delight to contemplate. We heartily welcome this addition to a well-known and carefully produced series.

Notes of a Naturalist. An account of Observations made during the Voyage of H.M.S. "Challenger" round the world in the years 1872-1876. By H. N Moseley, M.A., F.R.S. A new and revised edition with map, portrait, and woodcuts, and a brief memoir of the author. London: Murray, 1892. 8vo. pp. xxiv. + 540.

This is a new edition of a famous book, which occupies a high place among the records of exploring naturalists, being a worthy companion of Darwin's *Voyage of the Beagle*, Bates' *Naturalist on the Amazons*, and Belt's *Naturalist in Nicaragua*. It was originally published in 1879, and needs not to be praised. A memoir by Mr. G. C. Bourne gives in a few pages a vivid picture of the author, who died in November 1891. "Moseley's brilliant and always original contributions to science live after him, as also his influence on his pupils and on scientific progress during his life at Oxford—the pity of it that it was so short."

Sibbald's History and Description of Stirlingshire Ancient and Modern, 1707. Stirling: R. S. Shearer and Son, 1892. Pp. 81.

This is a reprint of the work of Sir Robert Sibbald, an Edinburgh physician and antiquary, who was, in 1682, knighted by the Duke of York, and appointed Geographer Royal for Scotland. It contains a somewhat minute account of the shire, with its proprietors in 1707, and is dedicated to one of them, the Earl of Linlithgow and Calander, Heritable Sheriff of Stirlingshire, a title attainted in 1716 in the person of the fifth Earl of Linlithgow. The volume is well printed and elegantly got up, and will be of much interest to the inhabitants of the county and to antiquarians generally.

A Trip to Spain and Portugal. By Thomas B. Foreman, 1893. London: Simpkin, Marshall, and Co. Pp. 121. *Price* 1*s*.

This trip lasted from 25th April to 27th May 1891, and cost 15 guineas. The author sailed from London to Lisbon, and then to Gibraltar, looked in at Tangier, and after seeing Valencia and Malaga, returned by sea to London, *via* Cadiz and Lisbon. Mr. Foreman got a great deal of instruction and amusement out of his trip, and narrates what he saw in a chatty and entertaining way. We need hardly remark, however, that the places best worth seeing in Spain are situated at a considerable distance inland.

The Jew at Home. By Joseph Pennell. London: W. Heinemann, 1892. Pp. 130.

Any one who has an hour at leisure may read this book with advantage. Although the author does not profess to have a very deep knowledge of the Jew at Home, he has certainly been able to give a readable and, as far as we know, accurate account of the life and actions of the Austrian and Hungarian Jew. The illustrations are admirable.

My African Garden. By Donald MacDonald. London: John Haddon and Co., 1892. Pp. 72 and Index. *Price 2s. 6d.*

Any one wishing to know how English vegetables and flowers may be grown in South Africa will do well to turn to this little book. Full information is given on the subject, and it can therefore be highly recommended.

An Official Tour along the Eastern Coast of the Regency of Tunis. By Amos Perry. Providence, R. I.: Standard Printing Co., 1891. Pp. 107 and Index.

Although this pamphlet was written some years ago, and has now been taken from the author's pigeon-hole, the information it contains is not out of date, and will interest those who are intending to visit Tunis. As that country has now been brought within so few days' journey of the United Kingdom, we can recommend it to those who are in search either of health or of a pleasant winter holiday.

Les Grandes Compagnies de Commerce. Par Pierre Bonnassieux. Paris: E. Plon, Nourrit, et Cie. Pp. 562.

M. Bonnassieux's work is intended by the author to form part of the more ambitious design of a *History of Colonisation* which he has sketched for himself. The *Study of the Great Commercial Companies* was, in its original shape, presented eight years ago as a competing essay upon a theme given out by the Académie des Sciences Morales et Politiques, which awarded it a prize, while finding that neither this nor any of the other competing memoirs on an important phase of trading and colonising enterprise was completely satisfactory. M. Bonnassieux has recast his treatise; and, while availing himself of the hints and criticisms of his judges, has supplemented the work with the materials of further research, and brought his history down to date, removing at the same time some of the heavier ballast of statistics with which it was weighted. It cannot be said that it has yet the compactness, the balance, the impartiality, accuracy, and thoroughness of treatment entitling it to the highest praise. Still, it is a valuable contribution to commercial history, especially of the great incorporated bodies of adventurers who laid the foundations of the French colonies in the East and in the West. M. Bonnassieux follows both national and geographical lines in arranging and classifying his materials. That is to say, he takes up the great trading enterprises of a particular country—Holland, England, France, Spain—and describes successively their operations in Europe, Asia, Africa, and America. The French companies naturally bulk larger in the story than would be the case if the subject had been treated from a British, or even from a cosmopolitan, point of view; nor should we be surprised to find a *soupçon* of national jealousy flavouring the account given of the recent revival in this country of the system of promoting colonisation by the agency of privileged commercial companies, and the progress of these companies in Africa and elsewhere. The author is content with the authority of the debates in the Chamber of Deputies on "la mission Mizon" for his statement that the Royal Niger Company has laboured "par la force ou par la ruse" to expel rival enterprise from the Niger and the Benué.

CO-TIDAL LINES FOR ENGLISH CHANNEL
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Fig. 1 DIAGRAM OF FORM OF TEMPERATURE AXIS

Fig. 2 TEMPERATURE OF

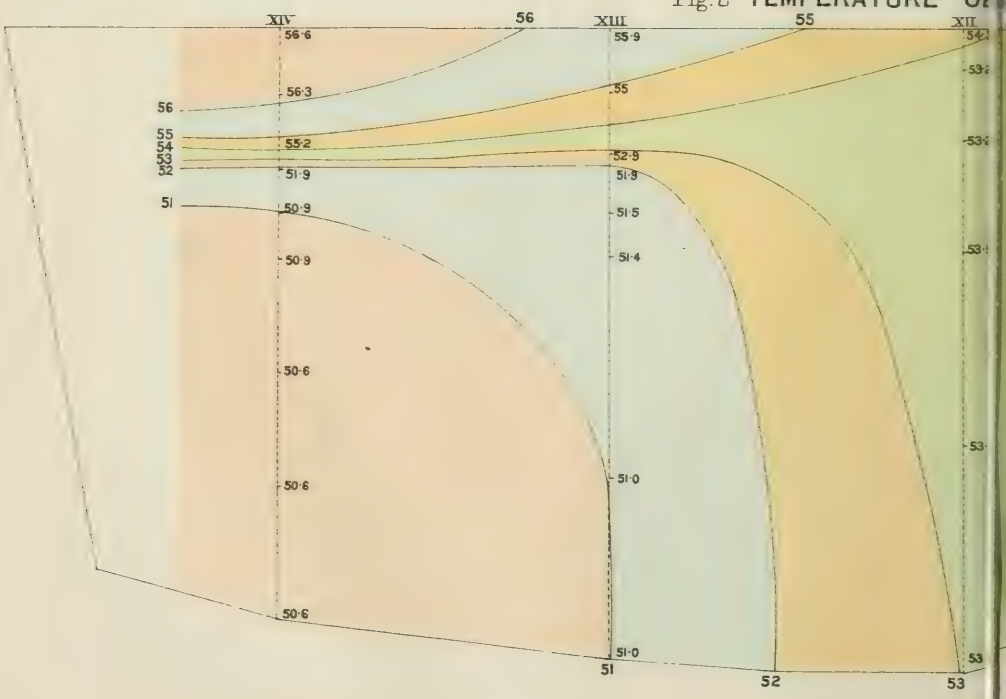
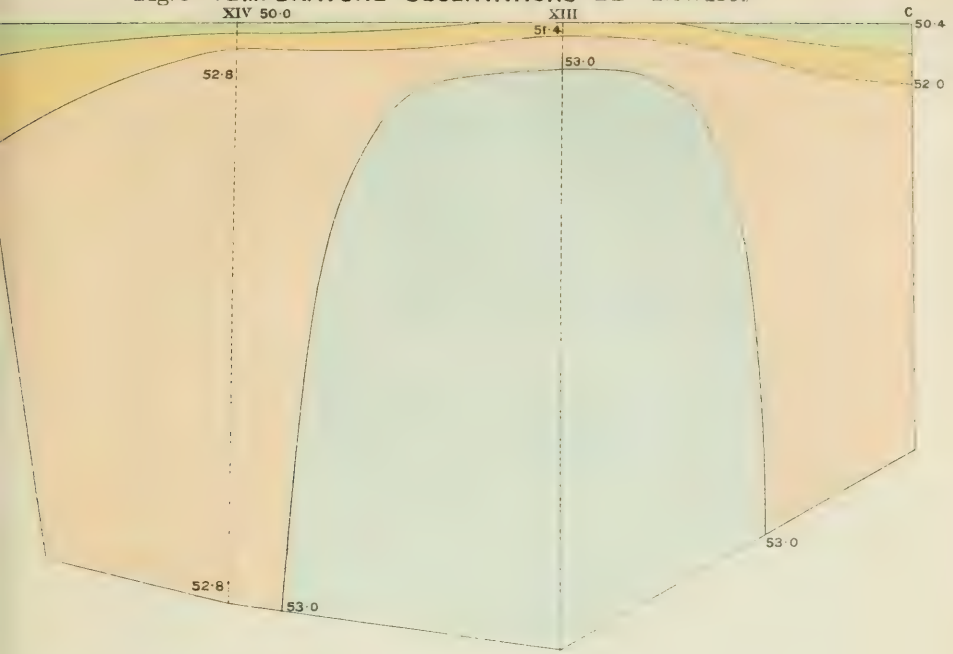
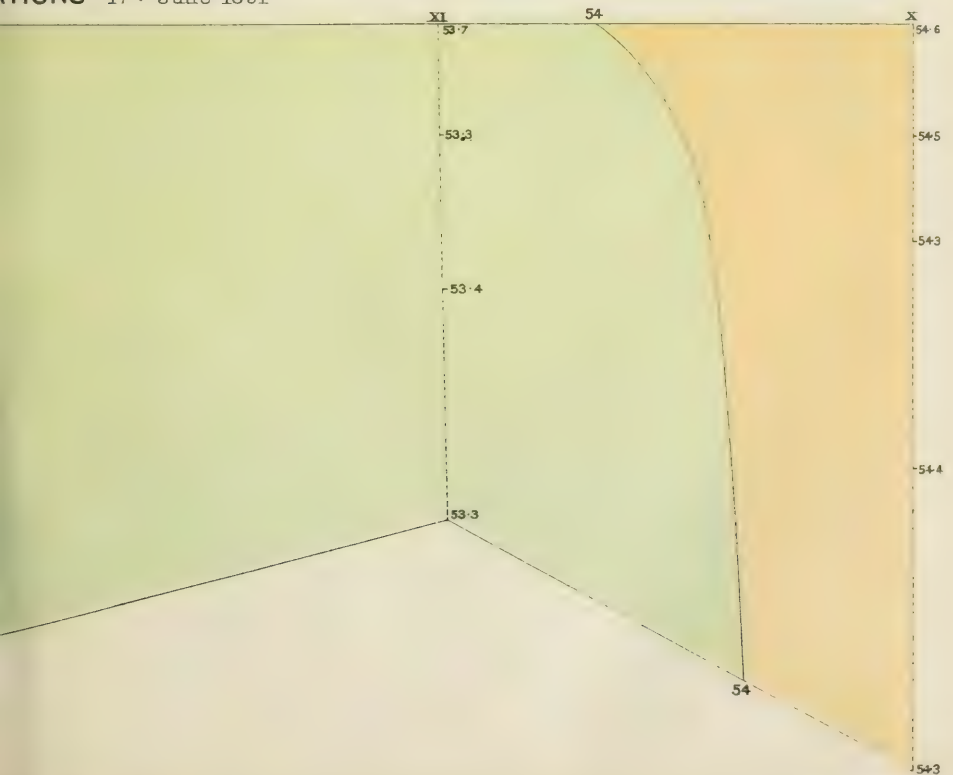


Fig. 3 **TEMPERATURE OBSERVATIONS** 24th Nov. 1891

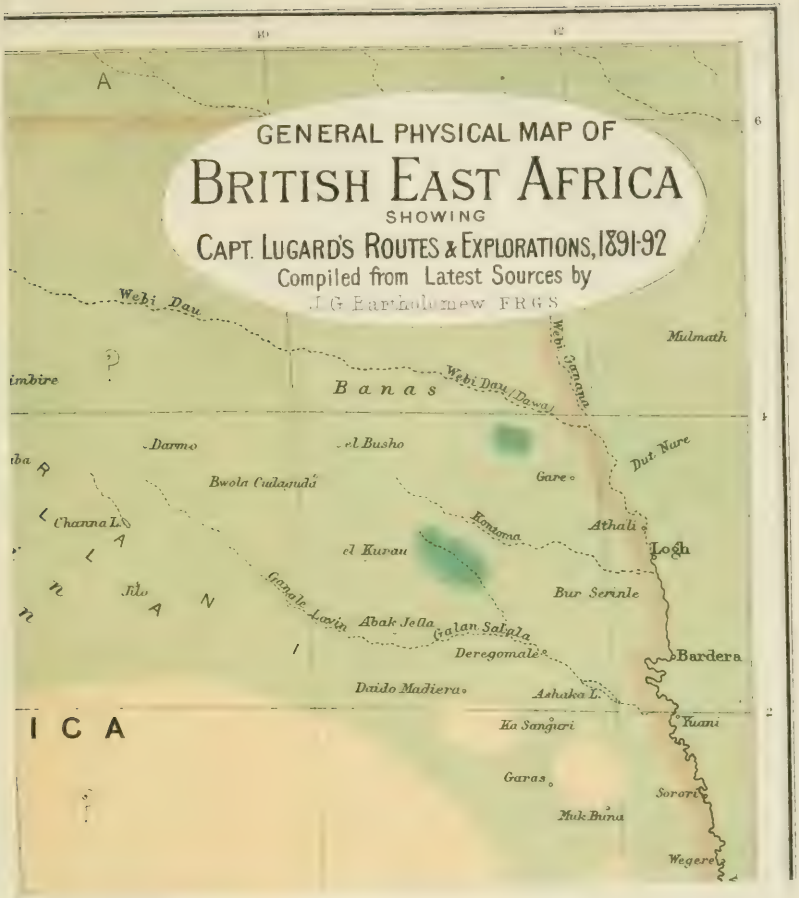


ATIONS 17th June 1891



John Bartholomew & Co.

Magazine, 1892.


GENERAL PHYSICAL MAP OF
BRITISH EAST AFRICA
SHOWING
CAPT. LUGARD'S ROUTES & EXPLORATIONS, 1891-92
Compiled from Latest Sources by
J. G. Bartholomew F.R.G.S.
Webi Dau
Webi Dau (Dawa)
Webi Ganana
Mulmath
Banas
Darmo
el Busho
Bwola Culaguda
Gare
Dut Nare
Channa L.
Konsoma
Athali
Logh
el Kurau
Bur Serinle
Abak Jella
Galan Salala
Deregomale
Bardera
Daido Madiera
Ashaka L.
Ha Sangori
Kuani
Garas
Sorori
Muk Buna
Wegere

GENERAL PHYSICAL MAP OF
BRITISH EAST AFRICA
SHOWING
CAPT LUGARD'S ROUTES & EXPLORATIONS, 1891-92
Compiled from Latest Sources by
BRITISH EAST AFRICA
UGANDA
VICTORIA NYANZA
GERMAN EAST AFRICA
CONGO STATE
INDIAN OCEAN
EXPLANATORY NOTE
Capt Lugards Route
Stations of I.B.E.A. Co
Proposed Railway
Arid Steppe Land
Grass & Cultivable Land
Dense Virgin Forest
Periodical & Salt Lakes
Scale - 1 S 600 000

THE SCOTTISH GEOGRAPHICAL MAGAZINE.

DESERTS OF ATACAMA AND TARAPACA.

By Mrs. Lilly Grove.

(*Read at Meetings of the Society in Edinburgh and Glasgow, January* 1893.)

Introductory Remarks on Chili.

The Spanish-American nations, although they are all of the same origin, with the same feelings and ideas—following the same religion, speaking the same tongue, subject to the same legislation—and though they have been conquered by the same race, nevertheless have not followed the same path when constituting themselves independent republics. Their development has not been equal, and their progress has been very different. While some have increased in population, wealth, and civilisation, others offer an example of stagnation so great that the question arises—have they not rather lost than gained in becoming self-governed?

As an example of the colonies that have progressed Chili attracts our attention. At first sight it might appear that she would have been the very last of them to attain prosperity. She was the poorest and the most backward of them all; her inhabitants did not number above 500,000, her commerce only reached about ten million *pesetas* a year, and the public revenue barely attained 2,500,000 *pesetas*. The celebrated Spanish geographer Torrente bears witness to this condition when he says, "This province has been the costliest and the least useful to the mother-country."

With regard to its mental and moral condition, Chili under the colonial *régime* was even more backward; the poorest and the most distant of the Spanish possessions, it was also the most neglected in intellectual development. Towards the close of the Spanish dominion

there were not ten men in the country who could understand any Latin but that of the commentators on the Laws of Castile, or of the treatises on Theology and Canon Law; nor were they able to read a page of French or of any other modern tongue. While Mexico and Peru had printing presses as far back as the 16th century, and the other colonies from the 18th, Chili was deprived of this aid to the propagation of knowledge until 1812, *i.e.* until two years after the beginning of the Revolution which gave her independence.

However, Chili conquered all these difficulties, and we find the German historian Gervinus unhesitatingly placing her in the first rank amongst the well-balanced republics; he says that peace and order were easily established in this province without despotism, and without an imposed dynasty, this happy condition of affairs being favoured by the influence of a moderate constitution. A regular government was established in Chili when its sister republics were barely organised, and, in 1820, a fleet and an army were formed strong enough to aid in the deliverance of Peru.

From that time Chili gave all its attention to the organisation of the internal government of the country, to the regulation of its finances, the payment of its debts, and the development of public instruction: in a word, the province did all in its power to lay the foundation of a great and prosperous nation. And these efforts have been crowned with complete success. Since 1830 Chili offers an example of what is unique in Spanish America, and rare in any part of the world: a regular succession of legally constituted governments.

Chili owes these boons to the large share which the upper classes have taken in public affairs, to the happy extinction of military despotism, to the patient endurance and aptitude for work of its courageous inhabitants, but, above all, perhaps, to the negligence of the Spanish Home Government—negligence which forced the colonists to rely entirely upon themselves, and which called for exceptional efforts when once the nation had shaken off the yoke. And, further, it must not be forgotten that Chili is indebted to a climate as perfect as any on the globe, to a sky so pure that all thrives beneath it, and to its position between the sea and great mountains, which not only yield a store of metals, but have also protected her in her infancy from the hostile incursions of the turbulent inhabitants of the surrounding countries. Finally, she owes much to the energy of foreigners, especially of Englishmen, who have fought for the Chilians, taught their children, constructed their railways, and established commerce in their harbours. Chili was the first of all the colonies to abolish slavery, to organise state education on a large scale, to grant commercial liberty, and to construct railways, telegraphs, and telephones. Religious liberty, too, has always been maintained; for Chilian law not only protects all Christian worship, but also gives to each sect permission to open schools, and to teach in them the dogmas it prefers. The highest praise is perhaps due to the educationalists, for they had the greater obstacles to overcome in the strong prejudices against the education of girls. Great opposition was encountered when it was proposed to open a school for girls in 1812. It might almost be said that the

ignorance of the women was part of their religion, and the Spanish writer Campomanes was looked upon as a revolutionist when he maintained that a woman might reasonably learn to read. Vancouver says that in the beginning of this century many beautiful ladies of the Chilian aristocracy, descendants of noble Castillians, could not even sign their names, and those who could, made pot-hooks and hangers like children just initiated into the mysteries of penmanship. But now the Chilian woman is not only well-educated herself, but is a source of instruction to all around her, and much credit is due to those first innovators who obtained this result.

The Chilians have shown in quite recent times—in the war with Peru in 1879—that they still retain the remarkable military qualities which formerly aided them so well in procuring their independence. In 1891, when the dictator Balmaceda wanted to overthrow the constitution, they once more gave proofs of their courage and common sense.

Before proceeding to describe the deserts more particularly, I shall venture to give a brief sketch of the region covered under the name Chili. The Republic extends from 17° 57′ to 56° S. lat. To it belong the islands of Diego Ramirez, at the south of Cape Horn, Juan Fernandez, San Felix, San Ambrosio, and the group of Pascua. The provinces of Tacna and part of Atacama were acquired in 1879, in the war with Peru; and according to a treaty between Chili and Peru, Tacna will be governed by the former power until March 1894, when the inhabitants will have the right to choose between the Chilian and Peruvian nationalities, and the republic which remains in possession will have to pay the other £1,250,000. The territory of Antofagasta, formerly Bolivian, is now, according to an armistice of indefinite duration, which was signed on November 29th, 1884, governed by Chili, and will continue to be so governed as long as this armistice, which may be looked upon as a treaty of peace, lasts. The population of the Republic is 2,526,969, the greater part belonging to the Caucasian race. There are about 50,000 Indians of pure blood, between Valdivia and the river Bio-Bio, who have lost their independence since 1882. Aimara, pure-bred Indians, are found in the provinces of Tacna and Tarapaca. The working-classes are a cross between the Spanish and the Araucanians; those of the north are Chilians who have intermarried with the Aimara. The Fuegians, who are very uncivilised, inhabit the southern extremity of the country and the adjoining islands, but their numbers are insignificant. The language of the country is Spanish; most of the Araucanians who come into contact with the Chilians, in agriculture or commerce, either speak Spanish or understand it.

During the war with Peru, in 1879-1882, Chili acquired the provinces of Tarapaca and Antofagasta from Peru and from Bolivia. By this conquest she secured incalculable additions to her national wealth, and, doubtless, for a long time to come, the financial prosperity of the country is assured.

It is only right to state that the development and success of the nitrate industry are due in large measure to the initiative and the courageous efforts of British engineers and British capitalists.

Atacama.

To turn now to a more detailed account of the deserts of Atacama and Tarapaca. The former—including the Province of Atacama, capital Copiapo, and the Province of Antofagasta, whose capital is the small port of the same name—has for its southern limit the river Copiapo, and for its northern, the river Loa, which runs into the Pacific at 21° S. lat. The western limit is the ocean, and the eastern the Andes, called the Cordillera Real. Amongst the mountains are numerous volcanoes, such as Licancour, Lindor, S. Pedro, Ollague, etc. To the north of the river Loa lies the desert of Tarapaca, and between the Cordillera Real and the Eastern Andes is the high tableland of Bolivia. In these latitudes rain is extremely rare, many years being absolutely rainless, while snow is found only on the high points of the Cordillera, where, however, it prevents the working of the mines, called "Minas de Temporada," during four or five months of the year. Between the Pacific and the Cordillera Real, covering an area of about 77,000 square miles, the desert of Atacama ranges up to a height of 14,000 feet in graduated terraces, surrounded and furrowed by numerous *cerros* (mountain chains), forming a sort of irregular network. In the meshes of this network we find dry and sandy plains, over which the crumbled volcanic rocks have spread a sterile felspathic dust. Many of these plains have sunk down and form inland lakes, at the bottom of which are layers of various saline deposits; they are fed by the snow of the neighbouring heights, or by rivers running from the Cordillera. Such are the lakes of Carmen, Carmen Alto, Pampa Central Salinas, Aguas Blancas, Toco, Atacama, Ascotan, etc. The lake of Ascotan—one of the curiosities of the country—is elliptical in shape, about 25 miles long, and 4½ miles wide. The dry salt plain, which was once the bed of the lake, is dazzlingly white to the eye, and is formed in variable proportion of sodium chloride, borax, sulphate of lime and of iron salts, magnesia, and small quantities of aluminium. Among the mountains which surround it, may be distinguished the old volcano Ascotan, whose entire summit was once blown off by an eruption and the *débris* thrown to a great distance. Then Mount Azufre (sulphur), whose yellow crest betrays the presence of beds of the substance which has given it its name; and quite close to the lake, San Pedro and Ollague, which overlook this extraordinary prospect.

Metallic veins run through these intersecting *cerros*, the rocks of which are tinted every shade of red and yellow, blue and green. Now and again some soft water-springs form little oases, covered with such vegetation as can live at that height.

The desert is continued into the high tableland of the Andes, which displays the same characteristics as the region we have just described; it is, as it were, a gigantic laboratory, whence the decomposed rocks, which have been dislodged by frost and ice, are carried down partly as sediment, partly in solution, by great rivers, such as the Rio Grande de Lippez, into immense pampas, over which the saline alluvia are deposited. Such is the Pampa Salina, which lies in S. lat. 20° and 21°, covering an area of nearly 250 acres. This high land was the birthplace of the

Incas; there, at a height of 14,000 feet, these fabulous warriors founded an empire and cities, and set forth from this gigantic fortress on their conquests in the American continent.

And, now, a few words on the historical and industrial state of Atacama. From the time when the Inca Yupanqui crossed the desert with his armies to conquer the southern regions of the Pacific, following the road which has kept his name—The Road of the Inca—and from the sixteenth century, when the Spanish generals D. Diego Almagra and Pedro Valdivia travelled over the same road with their conquering hordes to monopolise the Chilian gold mines—until the end of last century, the desert of Atacama remained unknown, except through the disasters of those who ventured to penetrate its immense solitudes. No one guessed that this dreaded region contained untold wealth, equal at least to that of the silver mines of Potosi, beneath its burning soil, in its darkest ravines, nay, even in its poisonous lakes. The discovery of the silver mines of Chanareillo by Juan Godoi, son of a poor shepherdess, was a revelation to the Chilian miners; and suddenly an army of eager and greedy, but brave and enduring prospectors, followed by a crowd of miners and traders, started up at the foot of the desert, and then advanced to the steep terraces of the mountain side. This conquest of the mines was long and difficult, but it was heroically carried out, and bore important results.

In 1848, the silver mines of Cabeza de Vaca, Lomas-Boyas, Garin, Bandurriâs, Tres Puntas, etc., were already being worked. Then were discovered the copper mines at Animas, and others in the vicinity of the ports Taltal, Paposo, and Cobre. The guano of Megillones, and afterwards the nitrate of soda found in the lakes of Carmen, Salinas, etc., gave rise to the industry of fertilizers. In 1871, the silver mines of Caracoles were opened, and the working of copper mines was largely extended.

In 1879, the occupation of the desert by the Chilian armies (during the war with Peru) gave a new impulse to the search for riches. Scientific commissions were sent there by the new government, and capital followed science, while security was brought by the Chilian domination. The lakes of borate of lime and of soda at Ascotan and Calcote, the copper mines of d'El Abra, Huantajaita Conchi, the silver mines of Sajasa, Colpa, Coypa, as well as the sulphur mines of the Cordillera, were successively discovered and worked. In many places fresh water was found, which rendered the desert habitable.

In order to foster the new industry, twelve small ports were made, one after the other, in which we find all necessaries collected, such as water condensers, provision stores, goods sheds, cattle markets, establishments of metallurgy, labour, administration, and, finally, railways and drinking-water canals. At the same time, there was formed in the desert, at each working centre, a little advanced post from which further expeditions could start.

Thus the desert of Atacama is not only accessible through twelve little ports, but it is also possible, when passing through it, to obtain, at intervals, shelter and assistance at the inland posts.

The line of railway which runs from Antofagasta to Uyuni and Oruro,

through the desert of Atacama, and which will eventually run up to the high table-land of Bolivia as far as La Paz, is certainly the most interesting example of a high-altitude railway. It provides a rapid and economical means of communication with the Pacific, and with the southern part of the Bolivian table-land, which until lately was accessible only to men hardened to the rigours and dangers of the desert. This narrow line unites a whole nation to the world, by giving it the means of utilizing for itself, and of spreading over the globe, the treasures of its soil—treasures amongst which it had hitherto lived poor and miserable. The railway was begun in 1876, and was at first a private one, its only object being to carry to Antofagasta the *caliche*, or raw nitrate, extracted from the *salars*. In 1890, after several extensions, the railway company obtained from the Bolivian Government the right to run between Uyuni and Oruro, and it is only quite recently that the concession of prolongation to La Paz, in the direction of Sucre, was obtained.

The terminus of the line is Antofagasta, a well-organised station, where English care and vigilance are easily recognised. It is a Chilian port,—Bolivia does not possess a single foot of coast line,—and is the principal outlet for Bolivian exports; indeed it may be said to live upon the trade which passes through it from that country. It is one of the worst ports on the coast; the surf is so great that it is no unusual occurrence for the boat, which conveys passengers ashore from the steamer, to capsize on the way—an unpleasant experience, as the bay abounds in sharks. Antofagasta has a population of 10,000 souls; it is certainly not a desirable place to live in, though cold is unknown, and rain never falls. There is no fresh water, the only drinking water being that condensed from the sea: but recently, the Antofagasta railway company—which is now an English company—has made works to bring water from S. Pedro, 11,500 ft. above the level of the sea. The town lies close to the sea; the houses are built of wood, and are only one story high, as is customary in most parts of Chili, on account of the frequent earthquakes. All the undertakings of the railway company are carried out with a uniform degree of excellence, and it may be interesting to note that this company has its principal seat in London, possesses capital to the amount of £1,600,000 and pays 12 per cent. to its shareholders.

Tarapaca.

Though not so interesting as Atacama, the desert of Tarapaca is nevertheless worthy of notice. This province has been Chilian since the successful campaign against Peru; it is the most important of all the mining districts of the north of Chili. By nature it is subdivided into five distinct zones. The first, the width of which is 21 miles, extends from the coast—the mountains of which are from 1300 to 6390 ft. in height—to the east, as far as the Pampas: these are sandy plains situated at a height of 3280 to 4265 ft., and are absolutely devoid of vegetation. In this zone are found the guano deposits as well as the *salares*, that is, deposits of sulphate of soda and of salt. The *salitre* or nitrate of soda, called in its rough state *caliche*, is only found there in

small quantities, and of an inferior quality. In the mountains there are mines of copper and silver; gold is found on the border of the river Loa, and nickel in the hills of Huantacaya. All the rocks of the coast are covered with guano, but it is now of little value, the rich deposits being exhausted. To the east of this is the second or nitrate zone, extending from the Rio Camarones to the desert of Atacama on the south. This zone is three miles wide, and over two hundred and fifty miles long. We will describe the nitrate deposits further on.

The third zone is formed by the great Pampa of Tamarugal, and is eighteen miles wide in the centre. The name of this province comes from a tree belonging to a species which grows there only, and which is kept alive by subterranean supplies of water. Professor Fed. Philippi says, in his account of Tarapaca:—"This province is even more desert than the desert to which it owes its name. The Pampa of Tamarugal is a plain of sand and of nitrate of soda—quite bare at the north, but towards the south we find some vegetation, the most remarkable growth being the Tamarugo (*Prosopis Tamarugo*, Ph.), the largest specimens of which are 3 ft. in circumference and 65 ft. high. Sometimes they form woods of small extent—sometimes they are found in isolated groups. It is evident that at one time this zone was very thickly wooded, as is proved by trees wholly or partly petrified; now we find only extensive deposits of borax and of sulphate of aluminium."

The fourth zone, to the east of the third, is formed by the buttresses of the Andes. The plains which are found in the various chains of mountains are sandy; it is only where streams run down periodically from the heights that a few spots are cultivated. If the inhabitants were to make canals for irrigation, this region might become an important industrial centre, as the ground is very fertile. In Pica and in Matilla an excellent wine, similar to port, is produced.

The fifth zone is formed by the Cordillera de Los Andes, and its width is 46 miles. Up to the present time these mountains have hardly been explored. This zone begins at a height of nearly 9900 ft., and extends up to a plateau whose height is on an average 13,000 ft.

In the fourth and fifth zones there is plenty of water, and in the third zone there is water close to the surface, but in the first and second zones it is scarce, and what little is found, either in wells or in streams, is brackish and not fit for use. Drinking water is brought from Arica, or distilled from the sea, and so is the water for the railway. This adds greatly to the expense of railways; the Iquique Company spent on water alone, in 1884, the sum of £112,406, 7s. 6d.

The nitrate industry of Tarapaca gives work to 10,000 workmen in the desert. They are occupied in 47 *oficinas*, or works, of which several employ from 500 to 800 men, and produce per day from 23 to 46 tons of refined nitrate.

The Chilian workman is the hardiest and the strongest in the world; he generally works from sunrise to sunset; he is most frugal, living chiefly on beans and ground wheat. He is also most hospitable to his fellow-workmen, but the simplicity of his wants make him rather independent of his employer.

Iquique is the capital of Tarapaca; the situation of this town is by no means inviting, and the bay is full of dangerous rocks, over which the surf breaks with violence, making the landing from the steamers very difficult, and it is no unusual event for the boat which takes you ashore to capsize.

At the back of Iquique are the sandhills, and if you were to inquire what is beyond these sandhills, the answer would be "more sandhills." The town possesses no buildings worth mentioning; the streets are ankle deep in sand; nothing will grow in Iquique—the ground is absolutely sterile. Drinking water is brought from a long distance in pipes, or by steamer from Arica, or it is condensed from sea water. Artificial flower-beds of earth have been made in the square of Iquique, where plants thrive most wonderfully. It is a real pleasure to walk out in the evening in the "Plaza" of Iquique and to enjoy the perfume of the flowers—the only ones in the town; though a few private houses have gardens, or so-called gardens—rather yards—in which a few tubs or cases are placed, and in which plants attain remarkable perfection.

Cattle in Iquique are reared on pressed *alfalfa*, a kind of clover, which comes in bales, mostly from the south of Chili. It is very expensive to keep a cow in Iquique, and water costs almost as much as its food. Fresh milk is a luxury, every one using condensed milk.

It is very surprising to the stranger who lands in Iquique, and who is sadly impressed by the utter desolation of the place and its want of beauty, how Europeans of refinement can live there. Yet we find numbers of English and German people, representatives of large commercial houses, settled in this great nitrate port.

Caliche.

Much interest attaches to the second zone, where the Nitrate industry is carried on, and the importance of this industry cannot be over-estimated; the capital employed on it is considerable, and the benefit received is exceptionally great. Nitrate of soda is the most active known fertilizer, and is already abundantly exported to Europe and the United States, where it spreads a fertility in marked contrast to the sterility of its native region. Powerful works, dotted about the desert, give a remarkable proof of what can be done by energy and science; finally, this nitrate is a source of unlooked-for riches to Chili and the poor provinces of the Pacific, bringing to them population, civilisation, and prosperity. Every day sees some new development of the nitrate industry, especially in its application to agriculture, in which it plays a part almost as important as water.

Nitrate of soda in its rough state, *i.e.* the saline rock which is called in Chili *caliche*, exists in the deserts of Atacama and Tarapaca at heights of 4000 to 12,000 ft., in vast deposits of almost superficial formation, which cover the whole or parts of the beds of old dried-up lakes, situated at the foot of mountains of volcanic origin. Some layers are found in Atacama; they cover the bottom of old lakes in the zones of Cachiyugal, Cachuial, in the district of Taltal—of Aguas Blancas, Del Carmen, and of

Pampa Central in Antofagasta, and Maricunga in the province of Copiapo. Others dominate in the Desert of Tarapaca, from the ravine of Los Camarones in the north, to the river Loa in the south, including the district of Toco. For the most part these layers extend along the western edge of an old evaporated sea, filled up to the level by rivers from the Andes, and called now Pampa de Tamarugal. This vast deposit continues for 95 miles, and forms the nitrate regions of Pisagua, Iquique, and Patillos. The nitrate beds in the deserts of Atacama and Tarapaca cover an area measuring 555 miles from north to south, between the parallels of 19° and 27° S. lat. The layer of *caliche* contained in these beds has a thickness varying from 4 in. to 11½ ft., the usual thickness being 9 in. to 3 ft.; beds of 3 to 11 ft. are exceptional. The *caliche* contains from 10 to 60 per cent. of pure nitrate of soda; in addition, we find sulphates of alumina, soda, and magnesia, common salt, and iodide of sodium, producing at the most 3 per cent. of metallic iodine.

The *caliche* has a variety of colours, white, yellow, violet, orange-blue, and various shades of grey; its structure is crystalline, and it becomes granular and sometimes porous. It has a slightly saline taste, and is soluble in water; when exposed to the air, it absorbs atmospheric moisture and dissolves. Nitrate of soda dissolves less readily when sodium chloride is present, and requires a high temperature to remain dissolved; so that volcanic eruptions having produced these solutions at a high temperature, large volumes of water, or lakes full of salt, were formed. Then, as these cooled slowly, nitrate of soda was deposited, and through natural chemical action, other salts were precipitated at the same time, particularly sodium chloride, forming *caliche* deposits. Later on, it seems that thermal springs appeared in these parts, charged with silica, which was likewise precipitated, and thence come the rounded fragments of opal, agates, chalcedony, etc., which are found in abundance on the surface, especially in the Pampa Agata at Antofagasta.

The working of the *caliche* is begun by attacking the ground at its most sterile side, and at the lowest part, when the incline permits it. Then rows of wells are made, and filled with powder to detach the soil, and the layer which forms the *caliche* is thrown back. The *caliche* itself is then carefully separated and carried to the *oficina* in carts; its further transport is usually by rail.

The deposits of nitrate were discovered in 1821, but they were not worked until ten years later. At first it was only employed in the manufacture of gunpowder, but, later on, a little more was used in chemical industries, until its usefulness in agriculture was recognised. It can be used with advantage in place of guano and artificial manures to fertilise the ground, for it contains 15½ per cent. of nitrogen, one of the most important elements required for the nutrition of plants.

The total area of Chili is about 465,221 square miles, and more than one-third of this area is occupied by mines. But we may say that mining in Chili is still in its infancy, and that its future is immense; for this country is so rich in mines, and its local conditions are, as we have shown, so advantageous, that whatever industry may be established in time to come, will, with sufficient capital, be productive of great and important results.

SOME NOTES ON SOUTH-EASTERN ALASKA AND ITS PEOPLE.

By Professor JOHN J. STEVENSON.

(*With a Map.*)

ALASKA is no longer an end of the world; distance is of so little account in these days of railroads and fast steamers, that far-away lands, such as Alaska and Siberia, are almost at our door. A week's travel by rail carries the tourist from New York to Tacoma on Puget Sound; in two, or at most three, weeks more he can visit the wild coast of British Columbia and South-eastern Alaska and return comfortably back to Tacoma; while if he be willing to spend another month, a steam launch will take him from Sitka to Oonalaska, and give him full opportunity of seeing the Aleuts in all their native unattractiveness. The excursionist to Sitka visits the Muir and Taku glaciers, and catches glimpses of many others; but he who takes in addition the Oonalaskan trip has the advantage of seeing, even though he may not explore, the noble glaciers of the Mount St. Elias group, and others beyond, with which Russell and Hayes have made us familiar.

The ready accessibility of South-eastern Alaska is due to the great expansion of commercial interests within the last decade; immense canneries have been established at many localities where salmon, cod, and halibut abound; mining for gold and silver, though only recently begun, is already important; and the Indians have shown an unexpected readiness to adopt the ways of civilisation: while those living in British America, away from the coast, have proved themselves thoroughly capable of making good bargains. The insignificant population of Alaska provides business for two large steamers throughout the year, while during the summer a third steamer makes two round trips each month. Thus Alaska is no longer an unknown land, and we are not now dependent on the indefinite statements made by early voyagers or on the records of the old Russian priests. Dall, Elliott, Russell, Hayes, Reid, and Wright have explored different parts of the region during late years, and have told of its people, its seals, and its glaciers. Comparatively little is known with certainty respecting its mineral resources, but prospectors are abroad in the land, and their discoveries will render a careful geological study necessary.

The route from Tacoma, in the State of Washington, near the head of Puget Sound, is practically inland, following the longitudinal bays, and winding among the islands which form an almost continuous archipelago from the Strait of San Juan de Fuca to Glacier Bay. Open sea is crossed at but few places, Queen Charlotte Sound, sixty miles wide, Milbank Sound, about ten miles, and Dixon's Entrance, about twenty miles, being the most serious; but short as these distances are, they suffice for susceptible passengers. Usually, however, Queen Charlotte Sound is crossed at night, when sleep renders passengers less liable to sea-sickness.

The rapid growth of cities on the west coast is exemplified by three towns on Puget Sound. Tacoma and Seattle are less than a score of

years old; yet in many ways they already resemble cities of thrice their age. Tacoma, consisting of a closely built central town and several offshoots out in the woods, embraces an area almost six miles square, and has broad streets on which millions of dollars have been expended for grading and plank-covering. It has been laid out with strict regard to the needs of future generations; the corporate limits are extensive and a proper eagerness to lay out lots and sell them is manifested by every person in the city. The readiness with which old settlers offer to make sacrifices to gratify the speculative stranger is really charming. Electric railways connect the centre and the suburbs, so that all parts of the area are reached with ease. Seattle was destroyed by fire a few years ago, and the new buildings are of a better type than the old, so that this city impresses one more favourably at the first glance than Tacoma. These cities are energetic rivals; each is the greater in the estimation of its citizens, who predict a less brilliant future for the other. A still more notable town is Anacortes, almost on the line between Washington and British Columbia, which has grown more rapidly than the removal of tree-stumps has advanced. It is an admirable specimen of the city *in posse*. The forest has been cut down, streets have been laid out and, to some extent, graded; houses have been built in clusters, separated by long intervals of stump-covered ground. Some of these buildings are imposing in size and architecture, and are strangely out of place amid a wilderness of stumps. But let no one think or speak slightingly of Anacortes; within ten years it may be the great rival of Tacoma, Seattle, and Victoria.

Victoria, the capital of British Columbia, on Vancouver's Island, is an attractive city; the moist climate makes it, like Portland, Oregon, a city of roses. The grounds about the houses are fragrant and beautiful, for the shrub-like bushes are covered with a profusion of blossoms, astonishing to one accustomed only to eastern scenes. This city, like all others on the Pacific coast, has its Chinese quarter, where joss-houses and theatres are equally conspicuous, just as in white men's cities churches and theatres rival each other in magnificence. Nanaimo, about fifty miles north of Victoria, is a small town, dependent on the well-known coal mines there and at Departure Bay, three miles further north. The coal from these mines is shipped to all parts of the Pacific coast, being far better than any thus far discovered in the States of Washington, Oregon, or California. The beds are of no little interest to geologists, in that many years ago they yielded fossils, which showed that a flora of well-marked Tertiary forms accompanied a characteristic Upper Cretaceous fauna—a fact which proved of great importance during the discussion respecting the relations of the Laramie group, now accepted as Cretaceous, though long regarded as Tertiary.

The Gulf of Georgia intervenes between Vancouver's Island and the mainland. Northwards it is broken by islands, and the steamer route follows Discovery Passage, where the tourist first makes acquaintance with the causes which render the steamer's movements uncertain, and subsequently is not surprised at the captain's apparent dilatoriness. Seymour's Narrows, barely half a mile wide, form a part of the passage; the channel

is deep enough, but very narrow, and jagged rocks project into it on both sides. Like several other straits and narrows along the route, this one can only be passed safely at slack-water, as the opposing currents cause whirlpools so strong that a steamer cannot be controlled with certainty. A very slight deviation from the course carries a boat on to the rocks, as happened to the U.S. steamer *Saranac*, which was wrecked in these narrows a score of years ago. The narrowness of the strait has suggested the construction of a railway-crossing here, as there are similar narrow straits to the east which can be bridged. The engineering difficulties are not great; the question of profit is more material.

Thence to Queen Charlotte Sound the steamer-route is through narrow channels. On the eastern side great fiords reach inland, exposing rugged mountains to view as far as the eye can see; the Cascade range is broader than in California and Oregon, and no plain intervenes between it and the ocean. The Vancouver coast is almost equally inhospitable, the mountains rising sharply, and in many places almost precipitously, to a height of more than a thousand feet. Further north, snow becomes more abundant, and waterfalls, rivalling in height those of the Yosemite, are of frequent occurrence. The type of scenery is practically the same throughout the voyage, so that, in spite of its grandeur, it becomes occasionally a little monotonous; there is an unbroken succession of mountains rising abruptly four or five thousand feet from the water's edge; of precipitous, or even overhanging cliffs, two thousand or more feet in height; of magnificent amphitheatres in which glaciers had their origin aforetime; and of long fiords where neither glaciers nor icebergs are any longer to be found. The mountains have a dense covering of cedars, firs, and spruces, among which one sees great numbers of dead trees. The destruction is said to be due, not to forest fires, but to lack of nourishment. The struggle for existence on the scanty soil is so severe that the older trees cannot maintain themselves against the younger, which form the dense undergrowth. Whether this explanation be consistent or not, must be left for others to decide.

The excursion steamer stops first at Wrangel, about one hundred and fifty miles north of Portland Channel, the boundary between British Columbia and Alaska, and not far short of six hundred miles north-westward from Victoria. There, in N. lat. 56° 30′, is a straggling settlement, which was of some importance during the Russian occupation, but has since declined. It is situated on the island of the same name, almost opposite the mouth of the Stickeen river, and is the source of supply for stations along that river; for there is still some trade with the region lying behind the Cascade range. For the present, however, little is doing, and the commercial prosperity of the place depends chiefly on the new industry of victimising tourists, which has grown up within the last half-dozen years; it has been very successful, as the steamers are crowded with passengers, who, for the most part, goodnaturedly agree with the Indians that they are legitimate game.

The Stickeen glacier is the first, or most southerly, of Alaska's great ice-streams; but as it fails to reach the mouth of its inlet, it lies beyond the range of the tourist. Ice is seen only after the narrow and treacherous

Wrangel Strait has been passed and Frederick Sound reached, into which it descends from the Baird, Le Conte, and Patterson glaciers, and is readily distinguished from the steamer. Thenceforward, glaciers are a common feature in the distance, but none is approached until the steamer comes to the head of Taku inlet to secure a supply of ice. There the Taku and Norris glaciers come down to the water's edge; the latter, known to tourists as the "Mud glacier," is covered with *débris* for a long distance, and its broad, rounded, gently sloping foot spreads out over a mud-flat, which protects it from the waves. Taku glacier, on the contrary, comes down directly into the water and presents a magnificent terminal wall not less than 250 feet in height and more than a mile in width. Many fragments break away from this glacier, but they are only of moderate size and seldom float as far as the mouth of the inlet.

Douglas Island, almost directly opposite this inlet, is now well known because of the Treadwell gold mine, which, despite the poverty of its pyritic ore, pays enormous dividends. The average yield is but four dollars per ton; yet so cheaply is the ore mined, crushed, concentrated, and treated, that the whole cost from the first blow of the hammer to the extraction of the crude bullion is but one dollar and a half per ton. An immense mill, with two hundred and forty stamps, crushes upwards of seven hundred tons of ore daily; the mine itself is merely an enormous quarry, and mining costs comparatively little money or skill. Juneau, on the mainland directly opposite the Treadwell mine, is a mining town of, perhaps, thirteen hundred inhabitants, most of whom are living by discounting the future rather than by utilising the present. The silver mines are still only "prospects," but specimens of great richness are almost as abundant as prophets of the coming magnificence of Juneau. Gold-mining, confined to placers, has proved reasonably remunerative when pursued on a large scale. Such work is carried on to greatest advantage in summer, when twilight continues all night (Juneau being in latitude 58°), whereas during the winter the working day is very short.

Lynn Channel, only a few hours' sail northwards from Juneau, is formed by the union of the Chilcat and Chilcoot inlets at its northern extremity. The Davidson glacier, entering Chilcat inlet from the east, in N. lat. 59°, has its origin very near to one branch of the Muir glacier, and is said to be not much inferior to it in size. All who have seen the scenery along the shores of this channel regard it as grander than that on any other portion of the route, but a dense fog obscured it and the Davidson glacier from our view. Rounding a peninsula in Icy Strait, one comes to Glacier Bay, which ends at the north in two inlets; the one at the east receives Muir glacier; the other at the west receives the Pacific; while further southward, on the west side of the bay, are other glaciers entering by broad passages.

Muir inlet, between four and five miles long, is somewhat more than a mile and a half wide at its head, this being also the width of the ice wall. The moraine, consisting of more or less imperfectly stratified gravels, underlying coarser and angular material, forms the shore. This deposit extends southward fully four miles on the western side, where

the shore-line is almost straight, but it ends at little more than two miles on the eastern, where the width of the gravels diminishes rapidly. Argillite forms the mountain overlooking the terminus of the glacier, but, as shown by Mr. Cushing, this argillite is overlaid by a limestone, which forms the shore, as well as the islands, of Glacier Bay. The "Dirt glacier" or first eastern tributary of the Muir must head up against an outcrop of this limestone, for one of the passengers on our vessel picked up a form like *Acervularia*, which, taken in connection with some *Leperditia* obtained by Mr. Cushing[1] in 1890, tends to show that the limestone is not younger than Middle Devonian. No clew to the age of the argillite has been obtained.

The main stream of the Muir glacier comes down directly into the inlet, where its wall is 250 feet high, or almost 300 feet to the top of the highest pinnacles. The depth of the water at one hundred yards from the ice, as measured by Captain Carroll of the steamship *Queen*, is 720 feet, so that the thickness of the ice sheet at the terminus is not far from 1000 feet. The ice wall is not uniform in tint; the upper portion, where the surface is irregular, having been thawed and refrozen many times, is milky white, but the lower portion, where contact with the water keeps the surface smooth and solid, is of a beautiful blue. Many of the fragments seen floating in the bay exhibit the same contrast. No enormous bergs were seen, the largest being not more than 300 feet long and 25 feet high; the water is not deep enough to float large bergs. Of those which do break away, the larger are soon stranded, for the bay seems to be shallower than the inlet, and only the smaller pieces reach Icy Strait.

The Muir glacier sends out wings on each side; perhaps it would be better to say that, as the waste of ice is more rapid in the water, the glacier extends further along the shore than it does in the inlet. The western side was not examined by the writer, but the prolongation of ice on the eastern side is very distinct, and projects certainly a third of a mile beyond the main body; Mr. Cushing[2] photographed it and described it in his discussion of the glacier. This prolongation rests on gravels in which peat occurs and which enclose a buried forest, the stumps of the trees being visible on this side of the inlet only at very low tide.

The tourist reaches the ice from a landing on the east side, near the cabin which has been occupied by the several exploring parties who have visited the glacier. The trail rises quickly to the top of the bluff overlooking the inlet, and follows its crest; for between this crest and the argillite mountain is the valley of a glacier stream, which enters the inlet about a mile below the foot of the glacier. As the moraine material is coarse and the rocks sharp, the journey is difficult, but yielding to the temptation to seek an easier path, the pedestrian invariably comes upon a quicksand. Hereafter, this laborious tramp of nearly two miles will be greatly shortened by a board walk—another illustration of the modern methods whereby science is made easy. The passage from moraine to

[1] *National Geographic Magazine*, vol. iv. p. 59. 1892.
[2] *American Geologist*, vol. viii. p. 220, pl. III. 1891.

ice is imperceptible, the first indication of the latter being a crevasse, or the rumbling of an underground stream. But, at barely two miles [1] from the landing, one stands on ice and has from a certain spot a view of the several branches or tributaries, as well as of the main glacier itself which comes down from the north-west.

The ice appears to be less crevassed on the eastern side, and several of the passengers who examined the glacier for several miles in that direction reported no difficulty, which accords with the observation reported by Dr. Reid [2] and Mr. Cushing.[3] But near the foot of the glacier and towards the north-west, the crevasses, as seen from a pinnacle, extend over a great area. Dr. Reid found these crevasses shallow.

The only systematic attempt at mapping this glacier and its tributaries was that made by Dr. Reid and his associates in 1890; they estimated the surface of the ice at three hundred and fifty square miles, and the drainage area at not far from eight hundred square miles. The geography of the region beyond this area is not known in detail; but there seems to be no reason for doubting that at least one of the eastern tributaries has its source close to that of Davidson glacier, while the main glacier must originate very near to the sources of the Pacific glacier, which enters the western inlet of Glacier Bay, and is said to be the finest of all the glaciers south of those of the Mount St. Elias range, recently described by Russell.[4]

The movement of the Muir glacier was determined by Wright [5] to be from forty to seventy feet per diem; but his determinations were based on observations of pinnacles. Dr. Reid [6] made more detailed and extended observations by means of stakes, and concluded that the maximum movement along the central line is not far from seven feet per diem. In spite of this rapid advance along the centre of the glacier, the ice front is retreating rapidly. From 1886 to 1890 it receded more than one thousand yards, as determined by a comparison of photographs taken by Wright and Reid in these years; and it was ascertained by Captain Carroll of the steamship *Queen* that the recession continues. More than this; at the line where the ice front of 1890 stood, Wright found the top of the ice, in 1886, to be 408 feet above the inlet, but when measured by Reid the height had diminished to 250 feet. The height of the wall is now approximately the same as when measured by Reid, though the front has receded many yards. The great loss along the front is sufficiently evident to the most careless observer, for immense falls of ice occur at brief intervals, and the formation of crevasses or the separation of masses is a common feature, as proved by the thunderlike noises heard within the ice at a short distance from the front. The rapid loss of mass at points removed from the inlet is shown,

[1] The distance as given may be too great, but it is thus reported by the officers of steamship *Queen*.

[2] *National Geographic Magazine*, vol. iv. pp. 30, 31.

[3] *American Geologist*, vol. viii. p. 209.
National Geographic Magazine, vol. iii.

[5] *American Journal of Science*, vol. xxxiii. p. 10.

[6] *National Geographic Magazine*, vol. iv. pp. 43 *et seq.*

not only by the contours of Dr. Reid's map, but also by the presence of ice masses, protected by moraine rubbish, on the mountain sides at fully one hundred feet above the present ice surface.

As the islands at, say, twenty miles below the glacier have been found covered with drift, and as Willoughby Island, about twelve miles below, shows well-marked striæ, it is easy to believe that, at no very long time ago, Muir and its neighbour in the other inlet were united and flowed down Glacier Bay, receiving as tributaries from the west the immense glaciers put down on the map as Hugh Miller and Geikie.

Before the glacier began its advance over the gravels, it was certainly much smaller than now. On the eastern side of the inlet, stumps of trees are seen at very low tide, while on the western, between two streams coming down from an old tributary of the Muir, now separated from it, is exposed a buried forest, well described by those who have explored this region. This, however, the writer did not see, as no opportunity was afforded for examination of that side. The gravel on the eastern side contains peat, which certainly is of very recent origin. The wood of the stumps, which is still sound, shows, according to Herrick, a structure closely resembling that of the Sitka spruce, the most common of the Alaska trees. Wright describes the trees on the western side as standing upright, the smaller ones preserving the normal conical appearance of a recently dead cedar. They grew one inch to two feet in diameter in a stiff clay, sometimes twenty feet thick and containing smooth boulders. The streams from the advancing ice must have unloaded their burden in this forest area, and the ice itself followed upon the gravel thus deposited. The date of the advance cannot be very ancient, for the wood still retains its soundness.

Whether the ice had advanced and retreated at any earlier period is difficult to determine from the data now known; but the conditions of the forest suggest that the trees came at least long after glacial action had begun; for, as Wright has shown, the trees grew on a boulder clay sometimes twenty feet thick. Such clay has but one origin, and such a mass required no little time for its accumulation.[1]

Leaving Muir glacier and returning down the bay, one sees the Pacific glacier in the western inlet, but the ice-choked channel makes navigation dangerous, and that glacier is not visited. The other glaciers on the western side are rarely seen by passengers on the steamers, as the bay is usually entered early in the morning, and left when the haze of twilight renders a distant view indistinct. The steamer soon reaches Icy Strait, out of which it passes into Chatham Strait, separating Admiralty Island on the east from Chickagoff and Baranoff Islands on the west. The latter islands are separated by the narrow Peril Strait, which deserves its name, for the channel is so tortuous that in one place the

[1] Detailed descriptions of the Muir glacier may be found in *The Ice Age in America*. G. F. Wright. New York, 1889. *Studies of Muir Glacier, Alaska*. H. F. Reid. *Nat. Geog. Mag.*, vol. vi. pp. 19-84. *Notes on Muir Glacier Region, Alaska, and its Geology*. H. P. Cushing. *American Geologist*, vol. viii. pp. 207-230.

The glaciers of the Mount St. Elias region have been described by Russell in the *Nat. Geog. Mag.*, vol. iii. pp. 53-203.

steamer was turned at right angles within her own length in order to pass between the buoys. The passage is made at slack-water and with extreme caution, which does not always prevent an annoying graze upon the rocks.[1]

Sitka, the capital of Alaska, is on the western side of Baranoff Island, in N. lat. 57° 02′; its population is much less than that of Juneau, but it is the older town, is the capital of the territory, and enjoys much more clear weather, whereas Juneau is only a mining town, and receives a fourth more rain. Sitka occupies a picturesque position on the incurving shore, behind which the surface rises slowly to form a beautiful recess in the mountains. The harbour, though doubtless attractive to an artist, has few advantages for the sailor; for it is contracted, ingress and egress being alike difficult. The main street of the town passes from the wharf by the old Greek church out to the Presbyterian Mission school. The houses are insignificant, except the Government building and the old Russian castle. The Indian quarter fringes the shore northward from the main street, and compares more than favourably with the other part. In some respects it is more modern, as several of the houses have been built after the most approved methods, while many of the best houses in the other portion are built of huge logs, which have withstood the damp climate for almost a century. Directly opposite Sitka is Mt. Edgecumbe, whose truncated summit tells at once the story of its origin. The mountain is fifteen miles away, but stands out sharply against the western sky as though the interval were but five miles. Its height above the sea-level is about 3000 feet, and, according to Mr. Koosher of Sitka, its crater is not far from 2000 feet in diameter with a maximum depth of, say, 200 feet. The rock is basalt, and perhaps the last eruption took place not very long ago.

The old Greek church in Sitka, which is the most noteworthy relic of Russian occupation, is still maintained by Russian funds; whereby are also supported the missions at St. Michael's, St. Paul's, and other localities in Northern Alaska. The Presbyterian Mission has a large training school, attended by Indians from all parts of South-eastern Alaska, in which are taught trades which can be profitably carried on in this country. The Mission has also a hospital beside its church. It is a liberal institution, for under its shadow and on its grounds has grown up the Alaska Scientific Society, whose museum of Alaskan ethnology is more than interesting; there one finds characteristic work of Eskimo, Aleuts, Athabascans, Thlinkets and the rest, consisting of carving, apparel, and implements of daily life. Geology has not been overlooked, for one finds here tusks and teeth of *Elephas*, as well as specimens of the various ores and minerals. A great part of the collections were made by Rev. Sheldon Jackson, who is now the Government Superintendent of Instruction for the territory. This museum is by far the most interesting institution in Sitka, illustrating, as it does, the differences between the Indians of South-eastern Alaska and those of regions beyond the moun-

[1] It should be called Destruction Strait, for, according to Petroff, it was so designated by the natives, because a large number of Aleutian Indians were lost there many years ago.

tains in British America and the United States. But to this subject we shall refer later on.

The climate of South-eastern Alaska, between 54° 40 and 58° 10′ N. lat., is a source of constant surprise to visitors from the Atlantic slope. It is true that Wrangel, at 56° 30′, is but a few miles north of Edinburgh; that Sitka, at 57°, is more than ten miles south of Aberdeen, and that Juneau is twenty miles south of Pentland Firth; but on the Atlantic coast of North America, the same parallels pass through bleak and dismal Labrador, while on Hudson's Bay, at 57°, lies Fort York, where the summer heat penetrates but a few feet below the surface. Yet, on this west coast trees grow three thousand feet above the sea at Wrangel, and up to the mountain tops at Juneau. The rainfall is great, amounting to one hundred and three inches at Juneau, though it is less at Sitka, directly on the ocean. The variation in temperature is not great; the mercury rarely falls below ten degrees above zero at Sitka, and as seldom rises above seventy-five degrees. Of course, the extremes are much greater on the mainland beyond the mountains, where the summer heat and winter cold are much more intense than immediately on the coast. Alaska has not been an unprofitable investment for the United States; its purchase secured the goodwill of Russia at a critical period in American history, and the purchase-money has been repaid, or nearly so, by royalties on seal fishing. But the agricultural capabilities are limited indeed; there is little land fit for tillage; and the moist summer with its low temperature is unfavourable to the ripening of grain. Gardens, however, are successful at Sitka and Wrangel, and the commoner vegetables are raised without difficulty. Berries of many kinds grow luxuriantly, and the coast Indians collect abundance of whortleberries, blackberries, and other familiar kinds for use in winter.

This remarkable contrast between the Atlantic and Pacific coasts of North America is due to the influence of the Kuro Siwo, or great Japanese current, which is similar to that of the Gulf Stream upon the west coast of Europe. And there are many points of resemblance between the two streams. The Japanese current is divided by a cold northern current at about N. lat. 38° and E. long. 150°, and fogs are produced by the contact, as they are when the Gulf Stream meets the Labrador current in the north Atlantic. The Kamschatka or northerly branch flows into Bering's Sea and passes through Bering's Strait into the Arctic Ocean, first striking the coast of Northern Alaska: the mild climate of that coast is due to it, and possibly its influence on the ocean temperature has much to do with the presence of fur-seals in Bering's Sea. The main body of the stream crosses the ocean and reaches the American coast not far from the straits of San Juan de Fuca, whence it flows southward to join the Great Northern Equatorial Current off Lower California. Many years ago, a junk with a cargo of beeswax was wrecked at the mouth of the Columbia river, and to this day pieces of the wax are thrown on the shore during severe storms. In 1833, a Japanese junk was wrecked off Cape Flattery, and in the early "sixties," another was found in mid-ocean by an American vessel on which the crew were taken to San Francisco.[1] Distinct proof

[1] George Davidson, in *U.S. Coast Survey Report for* 1867, pp. 202 *et seq.*

of a northerly branch from the main body is wanting; but currents exist along the Alaskan coast the relations of which are perplexing, and would be explained best by the existence of such a northerly branch, with such eddies as must result from the configuration of the coast. It is said that a Japanese junk was blown into Sitka harbour about seventy-five years ago, and there wrecked. Certainly the conditions at Sitka suggest the presence of a warm current not very far off to the west, for the average rainfall during fourteen years was 83·39 inches, the rainy days being 245 per annum. The temperature of the surface water at Sitka during August 1867, was 50·5° F., the temperature of the air averaging 53·4 F.; but in October, when cold water from the snows was coming down, the surface temperature had fallen to 41° F., while that of the air was 44° F.[1] One would hardly expect to find corals here, where the water in October is 27° colder than the water at the Bermudas in April, yet a large *Gorgonia*, fully four feet long, was shown to me by Mr. Koosher of Sitka, who is treasuring it up carefully for the Columbian exhibition; the Indians also offer small fragments for sale. Large starfishes and *trepangs* were lying on the pier when the steamer arrived, while in the water floated great ribbon-like seaweeds, seven or eight feet long and as many inches broad. Here also are *Echini*, five inches in diameter, which occur in such numbers as to be an important article of food for the Indians.

In spite of the superfluity of rainy and cloudy weather, South-eastern Alaska is said to be by no means an uninviting place. In summer the twilight almost meets the dawn, but winter restores the daylight to the general average, for at Sitka lamps are extinguished at nine in the morning, to be relighted at three in the afternoon. The white population, allured by trade or mining, shows great fluctuation, as mining operations, except on a large scale, cannot be carried on during the winter. The number of Whites and "Creoles," or half-breeds, is, as a rule, not more than 2000, though at times it may be exceeded.

Dall[2] recognises four families of native tribes in Alaska:—the Eskimo or Innuit, the Aleuts or Ununguen, the Athabascans or Tinneh, and the Thlinkets, the Koloshes of many English and French writers. The Eskimo and Aleuts, occupying the coast region, are termed Orarians by Mr. Dall, and number about 14,000; the Eskimo, for the most part, are found in the north of the Alaskan peninsula, but the Aleuts extend along the southern shore almost to Bering or Yakutat Bay, directly south of Mount St. Elias. The Athabascans, or Chippewayans, or, as Mr. Dall prefers to call them, the Tinneh, are closely related to the North American Indians of the Rocky Mountains and the plains. They occupy the interior of Northern Alaska along the Yukon river, as well as much of the North-western Territory of Canada, where they approach closely to South-eastern Alaska. But the Eskimo, Aleuts, and Athabascans rarely visit South-eastern Alaska. It is possible that some of the "blanket" Indians seen at Juneau may be Athabascans, for certainly not a few of them had features unlike those of the Thlinkets working on the wharf at that place.

[1] Davidson, *loc. cit.*

[2] W. H. Dall. *Contributions to North American Ethnology*, vol. i. Memoir.

Some of them were said to have come more than one hundred miles to exchange their pelts and to trade with tourists on steamer-day. If they are Athabascans and not Thlinkets, it must be conceded that they are equally keen in making bargains, though they show less good-nature and eagerness to trade.

The Thlinkets occupy the whole of the Alexander archipelago (in South-eastern Alaska), as well as the mainland from Yakutat or Bering Bay to Portland Inlet, the southern boundary of the territory. Though distinctly one people, having the same physical characteristics and speaking the same tongue or closely allied dialects, they are divided into several tribes, which seem to regard themselves as independent in origin. The Yakutats occupy the narrow coast area from Yakutat Bay almost to Cross's Sound or Icy Strait. The Chilcats dwell at the head of Lynn Channel, their chief village being several miles to the north of the head of that bay; they hold themselves aloof from the Whites except for commercial purposes, and resent any intrusion upon their village. The Sitkans occupy the large islands of the Alexander archipelago, except the southern portion of Prince of Wales Island, where the Hydahs have some villages. The Stahkin, or Stickeen, tribe occupy the strip of coast from Lynn Channel southward, and are especially numerous at Juneau, Wrangel, and Fort Tongas on Portland Inlet, as well as at some other places along the coast. The Sitkan and Stahkin tribes are divided into sub-tribes, which are generally recognised by the Indians—Sitkan among them seeming to refer only to those living on Baranoff Island, whereas the Sitkans of Chickagoff Island, immediately to the north, are called Hoonah.

The relation of the Hydahs, Haidas, or Kyghani to the other Thlinkets is not fully made out; only a small number of them are found in Alaska, their domain being in Queen Charlotte Island, British Columbia. They are unquestionably the finest of the coast races. Two of them, seen at Sitka, were readily distinguishable from the Sitkan Thlinkets by their more sharply-cut features. The Chimsyan tribe, formerly adjoining the Stickeen Indians on the mainland, occupied the peninsula of the same name, in British Columbia, until their disagreement with the religious authorities of that province led them to abandon their home and to seek another on Mary's Island, just within the limits of Alaska. They are closely allied to the Thlinkets.

Dall's estimate of Alaska's population, in 1879, was that it consisted of 25,704 natives, and 1800 to 3000 of Whites and "Creoles," varying with the seasons of the year. He estimated the Thlinkets at 5550, the Hydahs at 300. In 1880, the census agent, Mr. Ivan Petroff, who has given us one of the best descriptions of Alaska, divided the Thlinkets into eleven tribes with a total population of 6347.[1] This subdivision is more in accordance with the native practice than that of Mr. Dall, though the latter may represent the actual relationship. Mr. Petroff found 788 Hydahs. The number of Thlinkets seems to have changed little since it was first estimated in 1819.

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[1] *Tenth Census of the United States. Report on the Divided Population, Industries, and Resources of Alaska.* By Ivan Petroff, Special Agent.

The Thlinkets are of medium height, with well-built and sturdy frames; they are dark, not coppery; the hair is black, stiff and straight; the beard is not abundant; the face is broad and often heavy at the base so as to give an inverted egg-shaped oval; the features are distinct and the cheekbones prominent; the lips are full and, among the women, pierced for the labret or *kolosh;* the oblique eye of the Mongol is not rare. These people are warlike in disposition, and strifes between the tribes were of frequent occurrence prior to the Russian conquest. The Russians found much difficulty in gaining a permanent foothold. Old Sitka (New Archangel) was founded in 1799; but very soon afterwards several thousand Sitkans surprised and put to death all the garrison, except a few Russians and Aleuts who were absent when the attack was made and afterward escaped on an English vessel. At about the same time, the settlement on Yakutat Bay was destroyed by the Yakutat Indians; while hunting parties under the leadership of Russians were cut off at many places. But the indomitable Baranoff, the Russian company's agent, soon overcame the Indians and built another New Archangel on the present site of Sitka. No serious difficulty occurred again until 1855, when Sitka was attacked and a conflict ensued which lasted several days and ended in the overthrow of the Indians. Troubles sprang up again when the United States obtained possession of Alaska; but they were in a great measure due to ignorance of the people's habits, and still more to too much haste in acting upon rumour. Since the last collisions, in 1878, a war-vessel has been kept in Sitka harbour; its presence, as well as the great change in the people due to missions and to association with Whites, has prevented further disturbances.

Living in an archipelago, where the islands are as rugged and mountainous as the coast itself, with little fertile land and with a climate not favourable to agriculture, without cattle or places to keep them, the Thlinkets are necessarily hunters and fishermen. The waters of the Alexander archipelago, to the very head of Lynn Channel in N. lat. 59° 10′, are full of salmon, cod, halibut, and other edible fish; the mountains on the islands and the coasts teem with bear, deer, mountain goat, and other animals which yield food and clothing; while berries of many kinds grow luxuriantly near the shores. It is not surprising that when these people were discovered by white navigators they were called sluggish and indolent. It has been said that most men are as indolent as circumstances permit; but considering their rapid development, it may be concluded that the Thlinkets of olden time were as industrious as their circumstances permitted. The Thlinket canoes were, and still are, marvels; they are hewn from a single cypress log, and are often ornamented after a wonderful fashion. One of ordinary size holds six persons, but the war boat accommodates fifty. Ordinary boats are numerous at Sitka, where they are drawn up on the shore and in most cases covered carefully.

One who has seen the canoes is not surprised to find the Thlinkets excelling in carving of all sorts; those at the north have only wood and bone on which to exercise their skill, but the Hydahs of Queen Charlotte and Prince of Wales islands have a black slate, which when taken from the quarry is soft and easily worked, though afterwards it becomes

exceedingly hard. The slate carvings, mostly models of *totem* poles, are in no wise attractive from the beauty of the subject, but are striking examples of skill in treatment of material. The Thlinkets proper make odd carvings in bone; imitations of the human face on pipes; weird masks in both bone and wood; elaborate carvings on walrus tusks, which are far from devoid of beauty, while they attract atention by the delicacy of manipulation, though there may be little delicacy in the subject. The horn of the mountain goat affords material for spoons with carved handles which never fail to find a purchaser in the tourist. Silver coins are hammered into bracelets or spoons, which are then chased with a pocket-knife. Basket-work is carried to a high degree of excellence by the women, especially among the northern Thlinkets, the finest being that of the Yakutats. The baskets, made from the cypress root and coloured with home-made dyes, are so pliable that they can be packed flat in a trunk, are very durable, and are so close as to hold water. Yet this last statement does not always hold good, for the tourist trade has become so extensive that baskets of less compact texture are not unknown. But those of the best manufacture are water-tight, and it is said that if heated stones be thrown in, the water can be kept hot long enough to cook ordinary vegetables without injuring the basket in any way. The Chilcat women weave blankets from the hair of the mountain goat, which in closeness of texture rival the more celebrated blankets of the New Mexico Navajos. These are embroidered after the weaving is completed; the colours are brilliant, but are so skilfully arranged that they are not displeasing. As an industrious woman requires about six months to manufacture a blanket, the price—about seventy-five dollars—is by no means exorbitant.

The most ponderous examples of Thlinket carving are the huge *totem* poles, which tell the owner's genealogy. Such poles were seen in front, or alongside, of many dwellings in villages of British Columbia and Prince of Wales Island near which the steamer passed; but in Wrangel, where the steamer first stopped, they are far less numerous, and most of them are decayed, so that they are not likely to weather the storms of many more winters. The Hydahs of Queen Charlotte Island had great numbers of them a few years ago in some villages—"at least two carved posts for each house, and these, when the village is first seen from a distance, give the aspect of a patch of burnt forest with bare bristling tree-stems."[1] The Hydahs excel all the rest in the quantity and artistic character of their carvings; the stone *totems* made by them are simply models or copies of some of the large poles. The Chimsyan Indians, after their conversion to Christianity, cut down their poles. The Wrangel poles are amusing rather than interesting; the most grotesque is that surmounted by a human effigy wearing the ordinary chimney-pot, or stove-pipe, hat. Carved posts were seen in the Indian village near Juneau, but they are certainly rare in Sitka.

These posts have a connection with the totemic or clan system prevailing among the people of this coast. The Yakutat Indians[2] are said to

[1] G. M. Dawson. *Geol. Surv. of Canada; Rep. of Prog.* 1878-9, p. 116 B.

[2] Dall, *loc. cit.* p. 37.

deny the existence of the system, nor does Dr. Dawson [1] refer to it in his description of the Hydahs already quoted; but it certainly prevails among the Thlinkets of the Alexander archipelago, as well as many other North American tribes. Powell [2] has discussed its existence among the Wyandots, while its characteristics among the Omahas have been described by Dorsey.[3] Two, possibly four, great clans exist among the Thlinkets—the Wolf and the Raven, the Bear and the Whale. Doubtless there are others, but these appear to be the most prominent, and their *totems* are most frequently found on carved posts and pipes. A Hoonah pipe in sandstone has them all. The bond of the clan is much closer than that of blood, for marriage is exogamous and the child belongs to the mother's clan. A man belonging to the Wolf may not marry within his clan, but must seek his wife from the Raven or some other clan or *gens*. The child may not marry within his mother's clan, but may into that of his father, as its members are not his relatives.

The lot of women among the Thlinkets is far from enviable: it is true that Holmberg, as quoted by Westermarck, [4] asserts that the suitor must consult the wishes of the young woman, but Petroff [5] says that, when a Thlinket youth has found a maiden to his liking, he sends a messenger to her parents, or to the nearest relative, with the proposal. If the answer be favourable, he presents to the prospective father-in-law all the valuables that he can procure, honestly or otherwise, and soon follows in person. The wedding day is fixed and the marriage is celebrated with a costly feast lasting four days. This statement, which accords with the information received by the writer, shows that the woman's consent is not an important element in the case. The husband has the right at any time to send back the wife to her parents, returning the dowry with her; but if she prove unfaithful, he may, upon discarding her, retain her dowry and demand the return of his presents. In case the marriage is dissolved by mutual consent, the dowry and presents must be returned. Polygamy or polygyny is permitted, but the first wife remains head of the household. Veniaminoff is quoted by Westermarck [6] to show that polyandry existed; that in former times a Thlinket women could have, besides her husband, a legal paramour, usually the husband's brother. Petroff [7] in quoting also from Veniaminoff, says that the "assistant husbands" are maintained by the wives, and are husbands only when the true one is absent; at other times they are servants, hewers of wood and drawers of water.

Be this as it may, the condition of the Thlinket women after marriage is much worse than before. The effects of cruel treatment are sufficiently evident; while the carriage of the men is erect, that of the women is clumsy and uncertain, becoming more so with advancing years. As the period of parturition approaches, the woman is driven from the house

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[1] G. M. Dawson, *loc. cit.*
[2] J. W. Powell. *First Rep. Bureau of Ethnology*, 1879, p. 59.
[3] J. O. Dorsey. *Third Rep. Bureau of Ethnology*, 1881-82, p. 211 *et seq.*
[4] Westermarck. *The History of Marriage*, p. 215.
[5] *Report on Alaska*, p. 169. [6] *Loc. cit.* p. 169. [7] *Loc. cit.* p. 450.

and is compelled to find or make shelter for herself in the woods, no matter what the season may be. There, without assistance, she must undergo her suffering, usually amid rain and snow—an exposure often fatal alike to mother and child. The pitiable condition of the native women at Sitka induced Dr. Clarence Thwing,[1] in charge of the Presbyterian hospital at Sitka, to open a Maternity Home, where the women could find shelter in their need. Its necessity was promptly proved by the service it rendered in relieving almost a score of women.

The burial ceremonies of the Thlinkets are simple. Formerly cremation prevailed, being practised on all except the *Shamans*, who received, in many instances, scaffold burial. Now, however, under the influence of civilisation, cremation is less frequent, and one sees at Juneau and Sitka various forms of house and tent burial. Until very recently, custom required the sacrifice of one or more slaves when a well-to-do Thlinket died, in order that he might not be companionless. The poor dispose of their dead quietly by cremation or burial, but a great funeral feast is expected after the death of a wealthy man. Preparations for a grand wake were being made at Juneau when our steamer put in, but we left before the solemnity began. The heir is a sister's son or, in default, a younger brother, whose first duty is to marry the widow; this so-called *Levirate* is enforced so rigorously that a refusal to comply with the custom leads to serious disputes—in some cases to tribal war. Not long ago, a bright lad in the Sitka Mission school became heir to a deceased relative, and was promptly claimed by the widow, a woman of advanced years. The Mission authorities refused to deliver him up, thereby causing a disturbance so great and so threatening, that the boy's freedom had to be purchased with a considerable sum of money. If there be no near relative, the woman is not compelled to remain in widowhood; she may choose a mate from some other clan.

The killing of slaves at the death of a rich man is evidence that the Thlinkets believe in continued existence after death; but there is difficulty in obtaining any very definite statement respecting their original beliefs. The well-known disposition of savages and untutored people to give to questioners the kind of information supposed to be gratifying, explains the puzzling contradictions between statements made by missionaries and those made by travellers who are not in search of information to support or to overthrow any definite theory. This difficulty no longer presents itself in Alaska, as the converted Thlinkets do not hesitate to give, as far as possible, true statements respecting the religious beliefs of their race. The most serious difficulty is that experienced in the case of the trans-Mississippi tribes; they have been so long in contact with one form or another of Christianity that traces of Christian legend creep into their myths. It is sufficiently clear, however, that *shamanism* lies at the basis of their beliefs, and their legends deserve a

[1] Of course this refers only to the unchristianised Indians; among the others the condition of women is altogether different; they enjoy well-defined and recognised rights. The wealthiest Sitkan is the "Princess Tom," whose wealth in blankets, furs, and articles of vertu is estimated at from $20,000 to $45,000. Her skill as a trader is freely conceded by all tourists.

place in folk-lore rather than in the records of religion. The Thlinket universe is peopled with spirits good and evil, with which the *Shaman* is at least *en rapport*, over which, possibly, he has some control. For the most part, the Thlinket's respect for the spirits is due principally to the fact that they are invisible and so have the advantage of him. When the *Shaman's* services are needed, he brings himself into a semi-trance by abstinence from food, followed by violent gyrations about a fire accompanied by the beating of drums. His utterances in that condition are accepted as coming, not from himself, but from the spirit upon which he has called. When spirits refuse to obey the call, the blame is laid at once upon some person or family, who must suffer a severe penalty. The *Shaman* has a rival in the Medicine Man, who is only a wizard inferior to himself. The physician-sorcerer comes prepared with masks, drums, and rattles, with which to drive away the disease by frightening the evil spirits; but the terrible disturbance often brings the disease and the patient to an end together. The *Shaman's* power is declining. Only a little while ago, a celebrated sorcerer of the Chilcat tribe was defied and his tormentors cut off his hair without suffering any of the threatened ills. At Muir glacier, I purchased from some Chilcats a ring of teeth and bone carvings which had formed part of a *Shaman's* paraphernalia; some Stickeen Indians, who had come from Wrangel to build the board-walk on the moraine, examined the collection for a few moments and then said that that sort of thing is about done for, as their people have no longer much confidence in the Medicine Men.

The habits of the Thlinkets differ in many ways from those of Indians beyond the coast ranges on the mainland. The houses of those living on the shore, away from immediate contact with Whites, are of massive logs, surmounted by a bark roof, in which a large hole allows the smoke to escape from the fire burning in the middle of the floor. Such buildings were seen at Wrangel, as well as at many other places at which the steamer made no stop. The clothing of these people is abundant enough, but is far from being clean; clothing and houses are for protection, comfort being unknown.

But the Thlinkets are keenly alive to the advantages of civilisation, so that where they are in contact with the Whites they soon become dissatisfied with their condition of semi-savagery. They are quick in perception, and exceedingly open to religious influence, especially if it be accompanied with such instruction as enables them to improve their condition. The remarkable success of Mr. Duncan in converting the whole Chimsyan tribe to a thrifty, industrious Christian people is well known; and the haughty independent spirit of the tribe was manifested when, refusing to be meddled with by the religious authorities of British Columbia, they abandoned their ancestral home at Metla-katla, with its immense church and all their real property, to seek a new home on St. Mary's island just within Alaska. The abandoned Metla-katla is shown to all excursionists, for the steamer's course passes near to the Chimsyan peninsula. The Presbyterian missions at Tongas, Wrangel, Jackson, Juneau, and Sitka have been extremely successful, not only in changing the religious condition, but also, and even more, in changing the social

condition. The mission Indians learned English, were taught trades, and were trained to habits of regular industry. They were employed in preference to others in canneries, on fishing-boats, and as labourers in mines and on the steamer piers. Other Indians, seeing these advantages, promptly tried to imitate those connected with the missions. Comparatively few men now remain in the larger towns during the summer, for excellent wages are offered at many places; but in the long winter there is ample opportunity for the expenditure of wages earned during the summer. The clothing for the most part is like that of the Whites. The houses show a great improvement; instead of the low log houses barely eight feet high, one sees in the towns many good buildings, not of logs but weather-boarded, sometimes two or more stories in height and with bay windows to the top. Such a building was seen at Wrangel, with two great *totem* poles and an alligator in front; while almost the best house in Sitka is the new residence of "Dick the Dude," at the north end of Indiantown. Dick, who is a mission Indian, had held his "house-raising" only a few days before our arrival; the pot-latch, or feast, on that occasion is said to have cost him not less than five hundred dollars. The interior of the houses shows as great an advance as the exterior; instead of clay, one finds plank floors raised above the ground and in many instances provided with blankets or rugs. Not a few of the large houses have no chimney except the opening in the roof, which is usually provided with a movable cover. And these changed conditions exist beyond the immediate reach of missionary influence, largely because of the keen appreciation of comfort, for they are said to be equally marked at the canneries; but it must be remembered that the best workmen at the canneries are the mission Indians, and that the changes there are due to their example.

Thlinket women, whether Christian or heathen, whether they wear blankets or frocks, love dress and ornament. The uncivilised women paint their faces and pierce the lower lip for the hideous labret or *kolosh*. This ornament is seldom more than an inch long and its diameter is that of a large goose quill. The early navigators spoke of it as more than an inch in diameter; but that must be exceptional, for only small labrets were seen at towns where the steamer stopped. The taste exhibited in selection of dress-patterns is quite as startling as that sometimes displayed by white women. A shopkeeper at Juneau showed me a piece of brocaded silk which had been laid aside for a young "blanket" Indian, who wanted it for her Fourth of July dress. The material was too light in colour for hangings, too stiff for upholstering furniture, and hardly heavy enough for a grain bag; but its figures were large, well proportioned and artistic in general design. As a dress it would be a success for an Indian girl; it would fill all rivals with the bitterness of despair.

The future of Alaska is a problem. The seals of the North-west will soon be a thing of the past, like the *Rhytina* of the neighbouring waters; already the diminution apparent this year is bringing consternation to those whose interests depend on the catch; the prospect is that before many years have passed the skin of the fur-seal will bring prices as fabulous as those quoted for the skin of the practically extinct American bison. But the fish supply is incredible; at present it is utilised only at salmon

canneries; but eventually refrigerator vessels and cars with Alaska ice will bring Alaska salmon and halibut into competition, east of the Mississippi, with salmon of the Columbia river and the halibut of the east coast of Canada. The mineral resources have yet to be determined; coal has been found on Admiralty Island, but no definite test of its quality has been applied; gold and silver are mined at Douglas Island and on the mainland near Juneau, while gold in small quantities has been found on Baranoff Island. For the present, however, there is little prospect that, after the seals have disappeared, Alaska will be anything more to the United States than it was to Russia. Its gloomy skies and glaciated shores will prevent agricultural enterprise, while the extreme variation in the length of the day will render difficult any systematic development of mineral resources except on a gigantic scale. In all probability, its chief importance, as already said, will be as a source of fish-supply for a great part of the United States.

NOTES ON THE CONSTRUCTION OF TOPOGRAPHICAL MODELS.

By J. G. Goodchild, H.M. Geological Survey,

Lecturer on Physiography and Geology at the Heriot-Watt College.

Until near the close of the 18th century the condition of all the roads leading into the city of Edinburgh was such as seriously to impede the transport of any but the smallest loads. Even where the roads themselves were fairly well paved, the gradients in many places were so steep that the strength of the best draught horses of the day was often taxed to the utmost by the exertion required. The old road from Leith Walk to Newington enables us to form a good idea of the difficulties that attended the transport of heavy goods in the olden times. When this road was planned, the numerous braes on the direct line of route compelled the old road-makers to travel far out of their course, in order to lessen the gradients as much as possible, and to avoid the steep inclines presented by the north and south slopes from the High Street. Even in the height of the coaching days several of the main roads were but little better in this respect, as may be seen, for example, by following the old road to Queensferry where it crossed the Water of Leith. The construction of such viaducts as the Waterloo Bridge, George IV. Bridge, the North Bridge, the South Bridge, and especially the fine bridge on the present Queensferry road where it crosses the dene of the Water of Leith, effected considerable improvements, the importance of which it is very difficult for us to realise fully at the present day.

A year or so ago, Mr. Charles Jenner, F.R.S.E., who has long taken much interest in such matters, conceived the idea of having a topographical model of Edinburgh constructed, with the express object of illustrating

the nature and the full extent of the improvements that have resulted from the construction of the viaducts referred to. His object was to enable an intelligent observer to compare the many ups and downs of the circuitous roads of the last century with the easy gradients and direct routes presented by the main roads of the Edinburgh of to-day. For the purpose specially in view he considered that the proposed model should be on a fairly large scale, and that the gradients of the roads should be presented to the eye as nearly as possible as they appear upon the ground. The scale decided upon was 30 inches to the mile for distances, and a scale for heights sufficient to serve the purpose in view. Mr. Jenner commissioned me to undertake the construction of the model in accordance with his special requirements, which with the help of my two younger sons, I have now completed. As considerable interest has been manifested in the process of construction of the model referred to, it has been thought that a short description of the method of procedure followed might prove of some interest to the readers of this Magazine.

Under ordinary circumstances the preliminary step in the construction of such a model would be to draw two sets of profiles of the area to be represented, one longitudinal and the other transverse, each representing the relative height above the sea level (or other datum); then to transfer the lines to thin strips of sheet metal, which would be cut to the required form; next to fix each strip into its proper relative position on a wooden base-board; then to fill up the interspaces with some plastic material like modelling clay, or wax, moulded to represent the surface relief; finally, to reproduce from this a permanent model, either by casting in plaster of Paris, or else by carving in some more durable material like wood.

In all such cases an indispensable requisite is an accurate system of contour lines at close vertical intervals; or, better still, a specially measured series of levels ranging along the lines of profile required. In the case of Edinburgh neither of these could be obtained without a considerable expenditure of time and money. We had, therefore, to rely entirely upon such data as are furnished by the maps of the Ordnance Survey, especially by the very beautiful maps on the scale of 5 feet to the mile. Fortunately, Mr. Bartholomew has published a very convenient map on the scale of 15 inches to the mile, of which, in the preliminary stages of the construction of the model, we have made extensive use.

The area represented is as follows:—the middle of Princes Street is taken as a centre, from which the model extends northward to Canonmills, southward to near the Meadows, eastward to Holyrood, and westward to near Donaldson's Hospital. It therefore embraces most of the more conspicuous natural features of the older parts of Edinburgh. In planning the construction of the model, this area was divided into fifteen squares, each representing a quarter of a square mile. As a foundation we had fifteen base-boards constructed of pine, each consisting of two boards $\frac{3}{4}$ of an inch in thickness, firmly screwed together with their grains crossed, so as to check the tendency to warp. Upon each base-board, properly numbered and oriented, the principal streets and the more conspicuous objects were first laid down to the scale required. Then the

whole of the recorded elevations were inserted in their proper places. When these were completed, small holes were carefully bored perpendicularly through the positions referred to, and into these holes were afterwards inserted accurately-straightened wires of unannealed iron (No. 16 B.W.G.). The upper surface of the base-board being taken to represent the sea-level, the wires were then accurately gauged to the elevation they were intended to represent, and were then carefully cut to the height required. The number of elevations, and therefore of wires, on each block, ranged from seventy-three to considerably over three hundred.

When the blocks had all been prepared in this way, the next step was to fill in the spaces between the wires with some substance of as light a character as could be obtained. For this purpose we chose fine willow shavings, which were carefully inserted between the wires, one stratum above another, until the upper surface formed by the wires and the willow shavings bore some general resemblance to the form of the surface it was intended to imitate. Then a thin coating of very liquid plaster of Paris was carefully deposited, in small quantities at a time, on the upper surface of the shavings, every care being taken not to disturb the verticality of the wires and thereby displace the elevations. When the plaster coating had been distributed over all the fifteen blocks and had properly set, the base-boards were laid on their sides and thin plaster was poured in or "grouted" amongst the shavings, so as to consolidate them and enable them to form a suitable support between the base-board and the thin crust of plaster at the surface. Finally, the sides of each section of the model were plastered up at right angles to the base, and properly squared so as to make them fit well against the adjoining blocks. At this stage, the fifteen blocks were placed in their proper relative position next each other, and the surface moulding was proceeded with as if the blocks formed one solid mass. Three successive coats of the best plaster were laid one over another, always with reference to the final shape desired. In most cases it was found desirable to lay the plaster on to a small thickness above each of the wires, as it is much easier to carve this material down than it is to model the surface, as one would with modelling clay, by thin layers successively added on. At the end of a few days, when the plaster had set quite firmly, it was found that there was no difficulty in finding the upper ends of the wires (and therefore the elevations at each point so represented), as the wires had rusted slightly, causing a discolouration of the plaster which indicated the position of the points. The whole surface was then roughed out, by means of carving tools, as nearly as possible to the required form. At this stage the most important part of the work consisted in making frequent studies of each feature on the ground, and then in transferring the sketches from the note-books to the plaster itself. In a sense, the process may almost be described as sculpturing. Of all stages of the work this proved the most interesting and instructive, though it necessarily occupied much time.

Late in the autumn of 1892 the plaster model itself was completed, and was exhibited in the Geological Survey Gallery at the Edinburgh Museum of Science and Art, by the permission of Mr. Jenner.

Leaving further details of construction for the moment, it may be remarked that, as the model appoached completion, the part taken by glacial denudation in shaping the larger depressions of the surface within the town became increasingly evident. The great hollows scooped out of the comparatively soft shales and sandstones of the Carboniferous rocks, where the ice sheet encountered such obstacles as the Castle Rock, the Calton Hill, and the rocks of Arthur's Seat, are shown by the model to be manifestly due to this powerful agent of erosion. A great horseshoe-shaped depression extends westward along the Cowgate, through the Grassmarket, round the west face of the Castle Rock, and along the site of the old Nor' Loch, eastward to Abbey Hill, leaving as a ridge between them the "tail" of the Lawnmarket and the High Street behind the "crag" of the Castle Rock. In front of the Calton Hill the same glacial eroding agent has scooped out, on the south-west side, the hollow in which runs the North Back of Canongate, while on the western side of the hill lies the deep, lake-like, elongated basin of Greenside. The depression at the foot of Salisbury Crags and that of Hunter's Bog are other examples of the same process, of which the true nature is rendered evident by a study of the surface features represented by the model. It must be difficult for any geologist studying these features to resist the conclusion that, before the glacial period, the great hollows represented by the Nor' Loch and the Grassmarket Loch had no existence, but that the general level of the rock-surface at those points was at, if not above, the present level of the Lawnmarket.

The model in plaster of Paris weighs about three hundred-weight, and, being very bulky, is but little suited for use in a private house. To admit of convenient use, such a model should be as light as is consistent with suitable rigidity. Until a properly constructed model can be carved in wood, we have made a copy of the original plaster model in paper, which answers its purpose as well as could be expected, considering the nature of the material used. The mode of constructing the paper model, adopted after some unsuccessful attempts, was as follows:—Small strips of well-shrunk, unsized paper were fitted on to the surface of the plaster model by a judicious system of cutting calculated to permit of the strips remaining everywhere in contact with the surface. As each section was covered by the paper, this was damped with a wet brush, and thus easily pressed into the required shape. After the whole had become dry and had shrunk to its utmost limit, small strips of the same paper were coated with thin paste and laid over the first coat in such direction as to bind the underlying strips into shape. The process, in fact, resembled that which is adopted in affixing strips of sticking-plaster on a convex or a concave surface. When these had dried, a coat of modeller's paste enabled us to spread sheets of tissue paper over the entire surface. When this was gently beaten with a soft brush, the pliant coat of paper adapted itself very closely to every inequality of the surface. As soon as the whole had dried quite firmly, it was found that the paper mould, thin as it was, had taken an exact impression of the surface, and yet could be removed from the original without any difficulty. At this stage it was safe to put on a coat of

shellac varnish, followed by a second sheet of tissue paper. This was gently beaten with a soft brush and left to dry as before. Four coats of shellac varnish and as many sheets of thin paper then left the model sufficiently rigid to bear a certain amount of handling with safety. While this part of the work was in progress, we prepared a light wooden frame-work of the same size as the model, consisting of a thin base-board to represent the sea-level, upon which were fastened longitudinal and transverse strips of wood, carved to the profile of the surface they were intended to support. The separate sections of the paper model were laid upon these to ensure a correct fit, and when this had been accomplished, the fifteen sections of the paper model were fastened by their edges, and then removed so as to become further stiffened. For this purpose strips of tow were soaked in hot glue and fastened on the under side of the paper, being made thickest where support was most needed.

Then the interspaces between the *septa* on the frame were filled with fine willow shavings, as nearly as possible to the form of the surface, and on the bed so prepared the united sheets of the paper model were secured in their respective places by small nails. Two or three coats of varnish, afterwards laid on, have rendered the paper model sufficiently rigid to bear a fair amount of handling without risk of injury.

To make a model in wood from the original plaster cast, a different mode of procedure will be adopted. The model itself must first be contoured at close vertical intervals, and these contours will be first projected, by the projection apparatus used for similar purposes, on to paper, and thence to thin sheets of wood cut to the thickness required by the vertical scale adopted—one and a half vertical to one horizontal being the most suitable for general purposes. The contours will then be cut by a fine hand-saw, fastened into their proper places, and finally carved into shape in the ordinary manner.

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

The second Lecture to Young People was delivered on January 4. Mr. Graham Kerr gave an interesting description of a voyage to South America, and of his experiences in Argentina. Mr. J. B. Sutherland occupied the chair.

On Jan. 12 Mrs. Lilly Grove delivered a lecture to the Society on "The Deserts of Atacama and Tarapaca." Principal Grant Ogilvie presided, and Dr. Stewart, of Lovedale, proposed a vote of thanks to the lecturer.

On the following evening, Mrs. Grove repeated her lecture in Glasgow. Dr. G. A. Turner presided, and Professor Veitch proposed a vote of thanks to the lecturer.

The course of six lectures on "The Geographical Distribution of Animals," delivered by Mr. J. Arthur Thomson under the auspices of the Education Committee, were commenced on January 9th. The three remaining lectures will be delivered in February, on Monday evenings.

The Council of the Royal Geographical Society has passed a resolution giving the members of this Society the privilege of attending the meetings in London, on applying for a ticket, personally or by letter, at the Society's offices.

Members of the R.S.G.S. will also be admitted to the course of lectures being delivered in the Hall of the University of London by Mr. H. J. Mackinder, M.A.,

at the reduced fee of five shillings. The subject is "The Relations of Geography to History in Europe and Asia."

Commander F. G. Dundas, R.N., will describe his ascent of the Juba River at a meeting to be held in the Society's Hall on Thursday, February 2nd. He will lecture to the Glasgow Branch on Friday, February 10th.

On Thursday, February 23rd, M. Joël de Savoureux, French Consul, will deliver an address in the Society's Hall on Madagascar.

GEOGRAPHICAL NOTES.

By W. A. Taylor, M.A., F.R.S.E.,

Librarian, R.S.G.S.

EUROPE.

The Excessive Heat on the Continent in August.—From the observations of meteorological stations given in the *Mitt. der k. k. Geogr. Gesell. in Wien*, Bd. xxxv. Nos. 7 and 8, it appears that the unwonted heat experienced in the central and western countries of Europe did not extend to Spain and Italy. In many parts of Germany the thermometer rose between August 15th and 19th to maxima of 95° to 100° F., and at Biarritz 109·6° were recorded, whereas the maximum in Naples was 89·6°, and even in Algiers did not exceed 97°. The origin of the great heat must therefore be due to local causes—a clear sky by day, which promoted insolation, clouds at night, which prevented radiation, and a little rain in the morning, which, being quickly evaporated, formed in the lower parts of the atmosphere a moist layer adapted for the storage of solar heat. The atmospheric depressions passed over the British Isles in the direction of Lapland, bringing with them a comparatively cool temperature, whereas light winds from south-east to north-east, which in summer are always accompanied by heat, blew over the Continent. The theory that the abnormal temperature was due to an unusual emission of heat from the sun has no foundation.

The Lakes of Mansfeld, Prussian Saxony.—Dr. W. Ule reports that since May 1892 the surface of the salt lake has fallen considerably. Between June 4th and July 5th the vertical fall was 15¾ inches, which indicates an average daily outflow of more than 4,230,000 cubic feet, while the total loss from February to June amounts to about 222,450,000 cubic feet. In consequence the area of the lake has been diminished by 185 acres. The bed thus exposed is formed of loosely compacted marl, sand, and stones, and on the south side brown coal lies beneath. Near the shore the coal is covered by a layer of diluvium, which, within the limits of the lake, has been washed away by a stream that at some time or other must have flowed through the lake. On the exposed parts of the northern shore Dr. Ule noticed terrace-marks indicating a higher level at some former time. Great drought has caused a diminished flow of water into the lake, but neither this, nor an increase of evaporation, can account for such a considerable fall of the surface. Two funnel-shaped depressions in the bed of the lake have long been known to exist, and one of these, which was formerly 60 feet deep, was found to be 100 feet on June 18th, and 138 on June 28th. It is also shown by several facts that subterranean sources of supply have been cut off from the lake. One proof of this is that the salinity of the water is less than formerly. In 1887 it amounted to ·15 per cent., whereas in June 1892 it was only ·12 per cent. The failure of the

springs would not, however, by itself account for a fall of such magnitude. Dr. Ule believes the cause must be sought for in the pumping works of the Mansfeld mines, whereby the ground water has been removed, and with it much of the clayey deposit which prevented the water of the lake from filtrating through the underlying rocks. Many other collapses of the surface that have taken place in the neighbourhood are referred to by Dr. Ule.—*Globus*, Bd. lxii. No. 19.

Population of Russia.—According to statistics lately published, it appears that, in 1888, 4,268,601 persons were born in the 50 Governments of European Russia, while the deaths numbered 2,760,971. There was therefore an excess of births over deaths amounting to 1,507,630. Compared to that of 1887, the death-rate showed a considerable increase in towns, while it had diminished in country districts. The number of births rose both in the country and in towns.—*Globus*, Bd. lxii. No. 23.

ASIA.

Central Asia.—The colonisation of the territory of the Syr-Daria, which has been in progress for the past nine years, is now completed. Forty-seven colonies have been formed, containing in the aggregate 16,000 persons. It is also intended to colonise the western part of the Alai valley with Cossacks, and to form there a Cossack army. The district contains 123,000 acres of arable land, and can maintain a thousand families. The Russians have recently occupied Ak-tash and Tagharma, thus extending their influence towards the east.—*Revue Française*, Nov. 1st, 1892.

In-shan and Khingan.—In 1891 M. Putiata set out from Tien-tsin, and, traversing the plain of Pechili, reached the valley of the Luan-ho. At She-hol the party exchanged their carriages for baggage-mules, and marched northwards to Tung-tse-ni-zia, a village of Christian Chinese and the residence of a Belgian missionary. Leaving here his companion, M. Borodovsky, to investigate the zoology and botany of the neighbourhood, M. Putiata advanced across the Pei-chan plateau in a northerly direction, and, in spite of the opposition of the Mongols, crossed the Khingan Mountains by the pass of Kerkyn-davan. Returning by the Kholido-davan, lying further to the south, he made an excursion to the Tsiu-ei-za Mountain, held by the natives to be one of the greatest elevations of South-eastern Mongolia. He then set out with M. Borodovsky on the route to Dolon-nor, with the object of exploring the district in which Chinese geographers place the lofty mountain of Pe-chan ; and on the second day, leaving his companions to pursue their way, turned northwards to the sources of the Shara-muren, a tributary of the Lao-ho, and reached Dolon-nor by the western flank of the In-shan. To regain Tien-tsin, M. Putiata chose the route through the long narrow defile of the Du-shi-kou, M. Borodovsky taking the baggage round through Kalgan.

The country on the left bank of the Pei-ho, from Tien-tsin up to the skirts of the In-shan, partakes of the character of the plain of Pechili. North and west of Tien-tsin the ground lies at an elevation of 3 or 4 feet above the sea-level, and the river flows through it in a very sinuous course, with low banks and a slow current. This river is a source of great prosperity to the natives, and causes the fertile löss soil to produce abundant crops, but, like other Chinese rivers where an organised system of irrigation is absent, it occasionally overflows its banks, spreading desolation far and wide. Every patch of ground is cultivated, and no space is left for pasture or forests. Domestic animals are kept only in sufficient numbers to satisfy local demands. The landscape is dreary and monotonous, until the highlands of the In-shan are reached. On the border of this country the traveller meets near

Kou Chow with some low hills, at first isolated and afterwards strung together into ridges of an average height of 300 feet. The route then passes over a succession of rocky defiles and leads to Tsung-hou-Chow, an elevated valley on the slopes of the principal elevated region of the In-shan. These mountains have in all times been regarded as a natural barrier protecting China from the incursions of the northern barbarians. For a distance of 400 miles there are only seven routes across it practicable at all seasons of the year, and for further security the Great Wall, commenced in A.D. 213, was carried across the country, and forts were constructed at the most accessible points. The mountains, composed of granite, porphyry, felsite, and porphyritic tuffs, have a sharp outline, steep flanks, and bare pointed summits. They are arranged in parallel chains of no great altitude running from south-west to north-east. The vegetation is beautiful and varied; on the slopes of the mountains grow pines, cypresses, elms, poplars, aspens, and willows, and in the valleys are planted chestnuts, apricots, pears, plums, apples, walnuts, peaches, and other fruit-trees, which bring in no unimportant revenue to the native inhabitants. In the neighbourhood of Tsung-hou-Chow mulberries are also cultivated. Groves of oak, barberries, and hazel-nuts, too, abound. A handsome white peony and a fine iris attracted the notice of the travellers on the ascents to the passes. The fauna of the In-shan is not remarkable for its richness: hoopoes, wood-pigeons, and cuckoos are seen, and, more rarely, kingfishers. Numbers of grey herons build their nests in the poplars, and snipe frequent the valleys. According to the natives, large beasts of prey make their home in the recesses of the mountains, but the expedition had no opportunity of verifying the statement. The eastern part of the In-shan is rich in lodes of silver, and some of them, lying to the north-east of She-hol, are worked by the Government. Coal is particularly abundant in the plain to the north-east of Tien-tsin, and gold is found in the mountains.

Beyond the river Luang-ho, which, rising on the Mongolian plateau, cuts through the chains of the In-shan at right angles, the route ascends to the pass of Tie-myn, rising to a height of 1500 feet, and on the way passes through the Great Wall. Here the mountains with abrupt flanks give place to rounded hills of grit, and near Ping-tsuang-Chow the country assumes the form of a table-land scattered over with hillocks. She-hol, the next place of importance, is a town of 60,000 inhabitants, and contains the summer palace of the Emperor of China. Beyond this town the scenery again becomes wild, with narrow valleys, bare summits, and poor inhabitants who often shelter in caves. Only on the upper course of the river Isu-ho does the valley widen out and allow room for a few large villages. On its eastern side the pass of Siao-lu, 4700 feet high, crosses the watershed between the Luang-ho and Lia-ho, which is the boundary between the floras and faunas of In-shan and Mongolia. The undulating ground is covered with a dense carpet of verdure, whereon grow yellow lilies, large white peonies, poppies, and other flowers. The birch begins to appear in the higher situations, and, soon after, the mountain ash. Cattle-feeding is extensively carried on, though by no means to the exclusion of agriculture. Chinese financiers have ousted the native Mongols and appropriated their lands, dividing them among Chinese immigrants to grow grain for distilleries, which are scattered over the country in no small numbers.

From the pass of Siao-lu northwards to the farthest point reached by the expedition the character of the country is that of the Mongolian plateau, and its surface shows the powerful effects of the eroding force of the rains that descend in the months of July and August. Three regions may be distinguished. In the southern part, the plateau takes the form of elevated meadow-land intersected by streams which have excavated deep valleys. In the centre lies a tract of bare crags,

through which the head-waters of the river Shara-muren have forced their way. Adjoining this region on the north, lies the low chain usually called the Khingan—a name unknown to the local inhabitants. In the south the valleys are deep, with sides sloping very steeply up to the plateau, which attains a maximum elevation of about 6000 feet. The Khingan range is more pronounced in its northern portion, where it is crossed by the Kerkyn-davan, which lies 5200 feet above the sea-level, and 850 feet above the plain on the south-eastern side, the descent on the other side being only 400 feet. Southwards, the range gradually sinks, the passes become lower, and at last change into defiles. The rocks of which the chain is composed are porphyry and granite, and near Tsing-ping large crystals of quartz are found, which fetch a high price at Pekin, where they are manufactured into the spectacles worn by the numerous literary class of China. M. Putiata states that he found unmistakable traces of former glaciation in smoothly rounded knolls, cupola-shaped summits, and deeply striated rocks. The mountain Pe-chan, estimated by the surveyors of the Emperor Kan-Si at 15,000 feet, and located by them in the rocky country round the sources of the Shara-muren, could not be found. Aneroid readings showed that the elevation of this table-land was only about 6000 feet. The time spent among the mountains by the expedition was too short to allow of a thorough examination of their meteorology. It is certain, however, that the east Asiatic monsoons bring with them from the Pacific large quantities of vapour, which is precipitated over the country in July and August, flooding the streams with extreme suddenness, and giving them enormous power of erosion. The effect of the rains is also observable in the abundance and variety of the flora. On the elevated meadow-lands are found forms of the upper Alpine zone. Lower down blossom *Statice*, *Euphorbia*, *Clematis*, *Veronica*, and the lovely *Lilium tenuifolium*. Asters, iris, thistles, cloves, wild buckwheat, pease, and various kinds of *Umbelliferæ* are widely distributed; aconite and fleshy plants grow on the dry sands. *Cypripedium* is also met with, and *Delphinium*, the most beautiful of all the flowers. In the broader valleys the banks of the streams are carpeted with buttercups. In the ravines *Calamagrostis* and wormwood are so closely packed together that it is difficult to force a way through them. Of larger forms M. Putiata noticed firs and white birch in the most elevated regions, and, somewhat lower, rhododendrons, oaks, black-currants, and gooseberries. Maples, limes, bird-cherry, juniper, elm, and poplar also find a place in his list.

The fauna is not abundant, and consists for the most part of well-known forms. Large herds of *Antilope gutturosa*, *Cervus Wallichii*, and other deer were seen, and in the rocky ravines live squirrels, pole-cats, and badgers. Mountain goats and *Ovis poli* are hunted by the Mongols of the Khingan, and marmots and moles burrow in many of the valleys. The most common birds are kites, falcons, pigeons, hoopoes, pheasants, partridges, snipe, and owls. Black Mongolian crows were once observed, and the Japanese crow is sometimes seen. Among the insects may be mentioned *Acridium stridulum*, *Locusta viridissima*, and wingless varieties of the *Gryllidæ*; butterflies, of which the most common is *Parnassius Apollo*; and other representatives of the *Lepidoptera* order. The Mongolian population is being gradually driven out by Chinese immigrants, who have already carried their peaceful invasion as far as Dolon-nor and the Shara-muren. Coming first as traders, they soon permanently establish themselves on the land, and force the nomads to seek other pastures farther to the north and west. M. Putiata's report is published in the *Izvestiya* of the Russian Geographical Society, No. 2, 1892, in which number is also an account of the botany of the Khingan by M. Kuznetsof. An abstract of M. Putiata's article is given in the *Nouvelles Géographiques*, No. 9, 1892.

Annam.—In March 1892, Dr. A. Yersin set out for the purpose of discovering the sources of the Se Bang Kane (Cam ?) and then proceeding to the head-waters of the Don Nai, which flows past Saigon. The first part of this plan was executed, but time did not permit Dr. Yersin to reach the Don Naï, especially as its basin is separated from that of the Se Bang Kane by an enormous mountain mass which can only be crossed in the dry season. The region traversed is a plateau 1500 feet above the sea-level, and furrowed by numerous water-courses. It is covered by an immense forest, extending from the coast of Annam up to the Mekong. In some parts the forest is composed of gigantic trees, draped with orchids of many different species, and inhabited by a large variety of wild animals. Troops of elephants, rhinoceros, and wild buffaloes are frequently seen : the tiger finds stags and roebuck in such quantities that he rarely attacks men ; while bears and wild boars are by no means rare. Monkeys, rats, peacocks, snakes, leeches, and a host of smaller forms swarm among the trees or on the ground. In some localities the population is fairly dense, villages of 100 to 400 inhabitants standing at intervals of 7 to 9 miles, while other parts of the country are absolutely deserted. Dr. Yersin travelled as long as seven days without coming upon a single dwelling. He visited many savage tribes having no connection with the Annamites. They are much addicted to war, and have no central government, each village forming an independent community. Cattle, horses, fowls, and pigs are kept, and the elephant is used for transport purposes. A table of astronomical co-ordinates, which Dr. Yersin determined with great care during his journey from Nha-Kang (Ngai-Quan), accompanies his communication.—*Comptes Rendus*, Nos. 15 and 16.

Japan.—The census of 1890 shows that the population was then 40,070,000, or nearly 7 millions more than in 1872. Since 1887 the annual increase has been, on an average, 13 per thousand. This high rate is probably due to the good hygienic state of the country, for the excess of births over deaths is not greater than in most other civilised lands, while the mortality of infants under five years of age is less than in any country, except England. The proportion of the sexes at birth is 100 males to 97 females, and this proportion is maintained up to the age of fifty, after which the females begin to gain on the males.—*Nouvelles Géographiques*, Dec. 1892.

AFRICA.

The Canary Islands.—From the report of the British Consul at Santa Cruz, it appears that the trade of the islands is rapidly increasing, as their value as a coaling station for vessels crossing the Equator is becoming more appreciated. Bananas, potatoes, and tomatoes still form the most valuable exports, and the demand for fresh meat last year exceeded the supply, and had to be met by the importation of tinned meats. Consequently, British immigrants have started dairy-farming on Teneriffe and Gran Canaria, and the Consul recommends delicate young men to try their fortune in these islands. The population of Teneriffe is 93,000 ; of Gran Canaria, 75,000 ; of Palma, 32,000 ; while Lanzarote, Gomera, Fuerteventura, and Hierro have under 20,000 inhabitants each. The population is increasing, for visitors and permanent residents are flocking in, while, on the other hand, the islanders who emigrate usually return in about two years. Road-making is progressing in both the larger islands, and a concession has been granted for a railway, 25 miles long, from Santa Cruz to Orotava. The number of inhabited islands in the group is ten, and not seven, as generally represented. Last year the value of the exports was £267,856, and of the imports £665,392. More than half the trade was with Great Britain.—*Colonies and India*, Oct. 13th, 1892.

A Newly-discovered Range in Guinea.—Mr. Gilbert T. Carter, Governor of Lagos, has discovered a chain of mountains in the country of the Ondo, a Yoruba tribe. Scattered in the midst of the forests which cover the country, stand gigantic blocks of granite, so smooth on the upper surface that soil cannot cleave to them. These, therefore, being bare, afford a good vantage ground, but are very difficult to climb. Nevertheless, Mr. Carter succeeded in ascending one of the blocks in the neighbourhood of Ode-Ondo, and saw a chain of mountains towards the south-east, apparently 5000 to 6000 feet high. In front of them ran a range of rocky hills.—*Boll. della Soc. Afr. d'Italia*, July-Oct. 1892.

The Bia Expedition to Katanga.—Captain Bia arrived at the capital of the late king, Msiri, while Captain Stairs was in possession, and handed to the latter his reports. Starting from Lusamba, the expedition ascended the Sankuru from Pania Matumbo for a distance of fifteen days' march, to the confluence of the Luembe (6° 20′ S. lat.), crossed the watershed between the Sankuru and Lomami at an elevation of 4050 feet, and descended to the Lomami by the valley of the Luete, a navigable affluent of some importance. The country presents a series of large plateaus covered with pasturage, and here and there a solitary shrub. Rich Tropical vegetation grows only beside the streams. The Lomami was reached at a point about 60 miles below where Le Marinel crossed (vol. viii. p. 218), and 60 miles above the confluence of the Lukassi, where it was seen by Cameron and Wissmann. After some difficulty in procuring canoes, Captain Bia crossed the river, and, proceeding to the basin of the Lualaba, followed the course of the Lovoi, which, according to the natives, enters the main stream above Lake Kassali: it receives on its left bank a large tributary, called by Cameron the Killuilui, and by Bia the Kilubilui. The country is a wooded savannah: villages are fairly numerous, hidden by thick curtains of trees, and defended by palisades and *abatis*. Of the lakes connected with the Lualaba Captain Bia counted four—the Upemba, the largest, on the right bank; the Kabele, further to the south, and on the left bank; the Molunda, on the same bank, and to the north of the Kabele; and the Kabire, on the right bank, and a little to the south-south-east of the Kabele. All these are connected with the river by numerous channels. Bad weather prevented Captain Bia from exploring the Upemba, but he skirted its northern extremity, which appears to be the narrower. In the centre the water is very deep. The Kabele is surrounded by a belt of papyrus, and receives several small affluents on its western shore. During the rainy season the waters of the Lualaba flow into the lake. On January 14th, 1892, the expedition reached the banks of the river, and followed them to the villages of Kisamba, where the stream is fully 500 yards broad, and has a slow current. Further up, navigation is impeded by the rapids of Bundwe—probably the Kalengwe rapids of Le Marinel.

The Fungere (called Fungue by M. Le Marinel) is a small affluent of the Lualaba, entering on the right bank, between the lakes Kabele and Kabire. One of its parent streams, the Kafunge, descends from hot springs, which have a temperature of 126°, and emit an odour of hydrosulphuric acid. On January 19th the expedition encamped on the banks of the Tembwe Mufile, a little stream discharging itself into the Luvilambo, an affluent of the Lufira. In four days' march from the Lualaba, over country about 2000 feet above the sea-level, they arrived at a land of mountains and hills, having crossed a range called by the natives Kamukube. The camp was pitched at an altitude of 4400 feet, on the margin of the plateau of Manika, a vast plain covered only with short grass and abounding in game. The Lufira is the principal tributary received by the Lualaba above its junction with the Luapala. It is 300 miles in length, and falls, Captain

Bia states, into the lake Upemba. Three of its tributaries, the Luvilambo, Dikulwe, and Bulea, were crossed by the expedition. Bunkeia was reached on January 30th, and after Captain Stairs' departure the party took up its quarters in the fort he had constructed.—*Le Mouvement Géographique*, Nos. 29 and 30.

Katanga.—A letter from M. Delcommune has allayed the fears that were entertained lest he should have fallen into the hands of the Arabs, and shared the fate of Hodister. M. Delcommune crossed the Lomami at the same spot where, five months later, M. Bia effected a passage, and proceeded to the village of the king, Kassongo Kalombo, also visited by Bia and named by him Kassongo Niembo. In this neighbourhood he explored two lakes, the Bogia or Mosya (perhaps the Mokyra of Cameron) and the lake Samba, more to the south. The Lualaba was reached at the northern end of lake Kassali, which had never before been visited by a European, though it was seen at a distance by Cameron. The lake Kikambo, marked on maps below the Kassali, does not exist. After a halt of twelve days at Bunkeia, M. Delcommune marched eastwards to the post of the Congo State at Lufui, where he remained three weeks to explore the great mountain range of Konde Longe, and to collect supplies. Famine and war were raging in Katanga, Iramba, and Lunda, and therefore M. Delcommune found it impossible to stay in Ntenke and make excursions into the surrounding country, as he had intended. It would have been equally impossible, owing to want of provisions, to return to Bunkeia, and therefore no course remained but to make for the Lualaba. During seven days no village, no cultivated fields, no game were seen. Many of the porters died of starvation; and had the distance been as great as represented on maps, not a man would have survived. It proved, however, to be only about sixty miles. At length the expedition, having lost a third of its members, arrived at the village of Mussima on the banks of the Lualaba, which is there only 100 feet broad, with a discharge of 210 cubic feet per second. With great labour a boat was constructed capable of containing fifty men, and a number of canoes, and on February 25, 1892, the descent of the river was commenced. For seven weeks the expedition struggled on through the numberless rapids that encumber the bed of the stream, subsisting entirely on a meagre diet of vegetables, maize, and potatoes. At length they came to the rapids of Nzilo (the Shilo of Le Marinel; see vol. viii. p. 219), where the river rushes with indescribable violence through a chain of mountains a thousand feet high, which crosses the course of the stream at right angles. The gorge, resembling the cañons of the Colorado, is about 60 to 100 feet broad, and has a length of 47 miles, during which the river falls 1650 feet. M. Delcommune had followed the Lualaba for a distance of 125 miles; but here he was obliged to turn aside and scale the mountains, a task of such difficulty that in a whole month only 10 miles were traversed. Again famine stared the party in the face; the number of able men was reduced to 52, and desertions were of daily occurrence. It was therefore necessary to abandon the attempt to cross the mountains, which extended 37 miles further, and to continue the descent of the Lualaba; so with great regret M. Delcommune directed his course directly towards Bunkeia. Passing on thence to Tanganyika, he gauged on the way the Luapula at its exit from Lake Moero, and found that its discharge is 18,364 cubic feet per second, whereas the Lualaba at Kikonja, where the Lovoi enters, has a discharge of only 8935 feet. The Luapula must therefore be considered the main stream of the Congo.—*Le Mouvement Géogr.*, No. 31, 1892.

Mining in Madagascar.—After the campaign of 1883-5, Monsieur Suberbie obtained from the French Government a concession of territory situated between

the rivers Mahajambo and Mahavavy (?), and extending for 185 miles along the coast. Besides gold in veins and alluvium, the district contains mines of lead, tin, and copper, and deposits of silver. There seems reason to hope that before long lignite and coal may also be extracted. An industrial centre has been formed at Suberbieville, on the banks of the Ikopa, 2½ miles from Maevatanana, and now contains 5000 inhabitants. Twelve work-yards, scattered over the country at intervals of 20 to 25 miles, give employment to 20,000 persons. The great obstacle to progress is the difficulty and cost of transport, and M. Suberbie deserves credit for being the first to float a steamer on the rivers of Madagascar. The *Lorraine*, a flat-bottomed steamer of 60 horse-power, runs between Suberbieville and Mojanga during six months in the year, when the water is high ; and it is proposed to place two steamers of lesser draught on the river in the dry season. Two schooners and a flotilla of small boats ply along the Ikopa. It is probable, therefore, that prosperity is in store for Mojanga, the principal port of the west coast.—*L'Afrique*, December 1892.

AUSTRALASIA.

The Rainfall of New Zealand.—In *Symons's Monthly Meteorological Journal*, Nov. 1892, are published tables of the rainfall, extracted from Sir James Hector's annual report, and compiled from information contained in a paper by Mr. J. T. Meeson of Canterbury, N.Z. There are some discrepancies between the values given by the two authorities, but they are not of practical importance. One great defect in New Zealand meteorology is that the height of the gauges above the ground is not given. In early days several stations had two gauges, one on the ground and the other on the roof. An examination of Sir James Hector's table for the years 1864-91 shows that the fluctuation in the annual fall is much the same as in Europe. Except at Dunedin, years slightly wetter than any previously experienced are to be expected. At Wellington, for instance, the wettest year should theoretically have a fall of 72½ inches, whereas the heaviest annual fall was 66 in. in 1875. On the other hand, it is probable that Wellington will never have three consecutive years drier than 1889, 1890, and 1891.

The Bismarck Archipelago and the Solomon Islands.—With the exception of the volcanic peak of the Father and the Villaumez peninsula in New Pomerania (New Britain) and the south-western portion of New Mecklenburg (New Ireland) the elevation of the Bismarck Islands is insignificant, and though the two last mentioned are, respectively, three hundred and two hundred nautical miles long, the sea breeze is felt over their whole surface, so that trees requiring a briny atmosphere may be planted anywhere. Large rivers are not to be expected in islands of these dimensions, but brooks are numerous on New Pomerania, New Mecklenburg and New Hanover. On the coral islands and the pumice-stone plateau of Blanche Bay the ground is so porous that no streams can be formed. The rainfall is more moderate than on the mainland of New Guinea, though dry weather lasting for ten consecutive days is regarded by the settlers as a rarity and a calamity. A spell of dry weather sets in on New Lauenburg before the south-east trade-wind begins to blow, whereas New Mecklenburg with its range of heights arrests the moisture from the ocean. New Hanover receives abundant rain all through the year, and the isolated groups of Nissan, the Purdy Islands, etc., exhibit the oceanic character to a still greater degree. The soil of the islands, except in the narrow valleys, is light, even where the coral does not crop out, and hence the bush is thinner and more easily traversed than in New Guinea. These conditions of soil and climate render the islands suitable for the cultivation of *copra* and cotton. Another

difference between the Bismarck Archipelago and Kaiser Wilhelms-Land is, that the former is for the most part thickly populated by natives who have for many years been accustomed to trade with Europeans. Large quantities of *copra* are exported, and the yams and *taro* of the Gazelle peninsula are grown in quantities far in excess of the home consumption.

Buka, in the Solomon Islands, does not lend itself to European enterprise, for, except in the mangrove swamps on the coast and the mountains of the interior, it is thickly peopled by natives and extensively cultivated. The east coast of Bougainville has a very promising appearance, and its low hills, intersected by small brooks, would be suitable for coffee. A settlement on this island must, however, be well protected against attack, for the natives are warlike and quarrelsome, though, when removed from their home, they become excellent labourers and trusty policemen.—*Nachrichten über Kaiser Wilhelms-Land*, Heft 1, 1892.

GENERAL.

The Indian Ocean.—The *Annalen der Hydrographie*, Heft x. 1892, contains the results of important observations made by Dr. Plehn during a voyage to Java and back. In the early days of March prevailed northerly and north-easterly winds of nearly constant strength, but at the south-western extremity of Ceylon a south-easterly wind was met with. On the return journey, in the middle of April, the wind blew from the west, veering every now and then towards the north or south. No rain fell until the vessel approached the Straits of Malacca on the outward journey. In April heavy showers fell in the eastern part of the ocean, which in the western portion gave place to fine rain prevailing as far as the meridian of 70° E. : from this longitude to Port Said no rainfall occurred. Phosphorescence was observed on the surface of the ocean as far south as the neighbourhood of Ceylon, where it suddenly and completely vanished, and on the return voyage it was entirely absent as far as 55° E. long., after which it increased in intensity towards the west. Its appearance was probably connected with a current from the east-south-east, which suddenly raised the temperature of the water about 3½ degrees. The temperature of the air was most carefully observed. During March the daily mean rose from 78° to 83° F., the absolute mean being 80½° in March, compared with 82° in April. The daily range in the former month was about 4·2°, and in the latter 3·3°. The maximum and minimum occurred rather later in the day in April than in March. The maximum was often reached as late as 3 or 4 P.M., thus appearing, as on land, some time after the sun had passed the meridian, and not at noon or before, as some meteorologists have asserted is the case in open tropical seas. In the Straits of Malacca meteorological phenomena do not exhibit the same regularity as in the ocean. Heavy rain-storms, seldom lasting longer than half an hour, are of frequent occurrence. The barometer does not fall, but the temperature is lowered 3° to 7°. Dr. Plehn's article contains tables of temperature and a diagram showing the rise and fall of the thermometer by curves. Observations of the temperature and humidity were taken also in the engine and boiler rooms, with a view to the determination of the sanitary condition of these places.

Cruise of the "Albatross."—In the next report of the U.S. Fish Commissioner the itinerary of the *Albatross* in 1888-9 will be published. The distance traversed was 17,124 miles, the cruise extending between Lower California and the Aleutian Islands. The object of the expedition was to explore the waters adjacent to Alaska and the Aleutian Islands for the purpose of ascertaining the character

and extent of the cod and halibut fishing-grounds, etc. Nine hundred soundings were taken, and the dredge was lowered at 237 stations. The depression discovered by the *Tuscarora*, and named after that vessel, was shown to extend to a length of 400 miles, with a breadth of 30 miles and a maximum depth of 3828 fathoms. The *Albatross* then visited the Shumagin Islands, and sounded 600 fathoms off the mouth of the Columbia river, where fishing-banks had been supposed to exist. On the shores of Southern California the investigations were of a particularly interesting character. Captain Tanner describes the Guadalupe and Clarion Islands and the Alijos rocks—all volcanic formations. Clarion Island, rising from a depth of 2000 fathoms to an altitude of 1282 feet, is uninhabited and almost unknown. The chain of islands commencing with Guadalupe and extending to Los Alijos and the Revilla Gigedo group, hitherto regarded as a partially submerged range of mountains, was shown to be formed of isolated volcanic elevations. Captain Tanner was in command of the *Albatross*, and his name has been given to a fishing-bank discovered near Bishop's Rock, in lat. 32° 43′ N. and long. 119° 10′ W. Its area is about 17 square miles.—*Bull. of the Am. Geogr. Soc.*, No. 3, 1892.

The Temperature of the Earth's Crust.—Until now the deepest boring is that at Schladebach near Leipzig, which is carried to a depth of 5700 feet. It will, however, soon be surpassed by a boring at Wheeling in West Virginia, which is being executed by a private company solely for scientific purposes, namely, to ascertain the rate at which the temperature increases below the surface of the ground. A depth of 4500 feet has already been reached, and it is intended to carry on the work to a depth of 6000 feet. At Wheeling the mean temperature at the surface is 51½° F., while at the bottom of the boring it is 110½°. The average rise is therefore about 1.3° per 100 feet, which is somewhat less than at Schladebach, or at Sperenberg near Berlin, where the boring is 4165 feet deep. —*Mitt. der k. k. Geogr. Gesell. in Wien*, Bd. xxxv. Nos. 7 and 8.

Variations in the Plane of the Horizon.—Dr. von Rebeur-Paschwitz made at Potsdam and Wilhelmshaven, in 1889, observations with horizontal pendulums, which revealed the fact that the plane of the horizon is subject to continuous minute changes of position. The importance of these results induced the Akademie der Wissenschaften in Berlin to send out the observer to Teneriffe, where he stayed from December 1890 to April 1891. The conclusion he has arrived at from observations at places so far apart as Berlin and Teneriffe is, that under the influence of lunar attraction the comparatively rigid surface of the Earth rises and falls, just as the waters of the ocean are agitated by tides. The amplitude of those undulations is, of course, extremely small, but easily measured by a horizontal pendulum. The direction of the plumb-line shows also a daily periodical alteration. From nine o'clock in the morning, when it is at its most western position, it moves eastward with accelerated velocity until four o'clock in the afternoon, and then returns with slackening speed to its original position. This movement is, no doubt, due principally to solar radiation acting on the Earth's crust, and is not easily explained, seeing that the heat of the sun penetrates to no great depth. Observations in mines would probably throw light on this phenomenon. Another class of movements is evidently due to distant earthquakes. On April 17th, 1889, a great disturbance was noticed at Wilhelmshaven and Potsdam, 64 minutes after a great earthquake in Tokio. The Central Asian earthquake of July 11th, 1889, and the Patras earthquake of August 25th in the same year, also affected the pendulum. From the register it appears that smaller waves are superimposed on a system of

longer undulations. From an observation at Potsdam on February 11th, 1889, it was calculated that the waves had a length of 670 miles and a height of about 3·28 inches.—*Mitt. der. k. k. Geogr. Gesell. in Wien*, Bd. xxxv. Nos. 7 and 8.

MISCELLANEOUS.

Captain Lugard has published a collection of letters from French priests in Uganda, and, in another pamphlet, has replied to the charges brought against him in these letters.

On January 7 the last spike on the **Great Northern Railway** was driven on the western slope of the Cascade Mountains, Oregon, and thus another transcontinental railway route is completed.—*The Times*, January 9.

Lieutenant Peary is to lead another expedition to Greenland—like the former, under the auspices of the National Academy of Sciences in Philadelphia. Three years will be devoted to the exploration of the north coast.—*Petermann's Mitt.* No. 12, 1892.

Herr von Behr has visited the island of **Mafia**. A large part of it is covered with coco-palms, and a considerable quantity of *copra* is exported to Kilwa. The interior is swampy and unproductive. The chief village is Shola.—*Globus*, Bd. lxii. No. 24.

An illustration of the **lake on the Great White Mountain**, from photographs taken in 1891 by Captain Goold-Adams, R.A., is published in *The Geographical Journal*. Captain Goold-Adams calculated the height of the mountain from aneroid readings to be 8700 feet above the sea-level.

Until last year the **date on Samoa** was the same as in Australia. The 5th July was, however, called the 4th. As Samoa lies to the east of the 180th meridian east of Greenwich, the time-reckoning now accords with the custom of navigators. —*Annalen der Hydrographie*, No. xi. 1892.

This year the Royal Geographical Society has commenced the issue of a new periodical, **The Geographical Journal**, to replace the former *Proceedings*. Each number will contain ninety-six pages. This is likely to become a more important geographical publication than its predecessor.

The January number of the **Annals of Scottish Natural History** contains some important papers, among which, *Contributions to a Fauna of the Shetland Isles*, by Mr. Harvie-Brown, may be specially mentioned. The *Zoological* and *Botanical Notes* are communicated by observers in different parts of the country, and are full of interesting matter.

M. Venukoff reported to the Paris Geographical Society last November (*C. R.* Nos. 15 and 16) that the Russian geodesists had measured a base 5·7 miles long by the **method of M. Eclérine**, that is, with a steel thread supported only at its extremities, and therefore forming a catenary. The result was very satisfactory, and the work progressed eight or nine times more quickly than by the ordinary method.

M. Venukoff has communicated to the Paris Geographical Society an extract from a letter of **M. Dutreuil de Rhins** (*C. R.* Nos. 15 and 16). The traveller writes from

a point a short day's journey beyond the sources of the Keria-Daria and Keria-Kuttel, in the direction of Ladak. He could find no beaten track, and was doubtful whether to march towards the sources of the Yang-tse-Kiang or endeavour to reach the Tengri-Nor.

Mr. M'Millan, European agent of the Manitoba Government, states that while the number of European emigrants settling in the United States and Australasia has considerably diminished in 1892, there has been an increase of 24 per cent., compared with the returns of 1891, in the immigration to Canada. A larger proportion of the new comers than formerly have settled in Manitoba and the North-West. Last year several thousand Americans crossed the boundary to make a new home in Western Canada.—*The Times*, January 9.

Kauri gum, of which 8388 tons were shipped from New Zealand to London in the year 1891, is found only in the district of Auckland. It is consolidated turpentine that has exuded from forests of *Kauri* pine now buried beneath the ground. About 5000 men are engaged in digging for this article, and an active and experienced man can earn as much as £3 to £4 a week in this occupation. The supply will come to an end in about fifty years, as the existing forests do not yield gum in any appreciable quantity.—*Colonies and India*, December 17th.

In a pamphlet entitled *La Rappresentazione Orografica a luce doppia*, the Signori Basevi and Fritzche advocate a new method of representing mountains on maps. Mountains are shaded and tinted, sometimes as though illuminated by a zenithal light, sometimes with shadows cast, as it were, from a side light. The authors' method is to engrave a block on each system, and print off from both on the same map. The result gives, they maintain, a more vivid idea of the configuration of the surface. Maps of the central group of the Gran Sasso d'Italia show the different effects obtained.

NEW BOOKS.

The Growth of English Industry and Commerce in Modern Times. By W. Cunningham, D.D. Cambridge: At the University Press, 1892. Pp. xvi. + 771. With two Diagrams. *Price* 18*s*.

This volume, which completes the author's survey of English industry and commerce, is of high importance, not only for the reader who would trace the industrial growth of England, but also for one who would undertake an intelligent study of our general history. Green did much by his *Short History* despite its flaws) to elevate the study, and it is by such works as the present that a fresh advance will be made. No work published in England since the appearance of Bishop Stubbs's *Constitutional History* shows so thorough an acquaintance with the available materials, and so clear a perception of historical forces, as does Dr. Cunningham's *Growth of English Industry and Commerce*. The numerous footnotes, and the long and invaluable list of authorities, give indication of rare familiarity with the best sources of information; while the inter-connection everywhere shown to exist between economic history and general change and growth—the essence and spirit of every paragraph—reveals to the reader a master-mind in the understanding of history.

The volume conducts us from the Elizabethan age to the repeal of the Corn Laws, and takes as its great theme the rise and fall of the Mercantile System—from which, as here described, even the *doctrinaire* economist may condescend to learn a lesson. But the vastness of the subject and its complexity preclude a detailed notice. The Elizabethan system is presented in its entirety under the following divisions, which are maintained throughout for subsequent periods with slight variation :—A general political survey ; shipping (including navigation Acts, promotion of companies, etc.) ; plantations ; industry ; agriculture ; the poor ; finance ; and economic opinion or doctrine. Some very suggestive remarks are made on the general character of the Elizabethan system. The age witnessed both rapid industrial and commercial development, and systematic and effective legislation : two processes and products often deemed incompatible—legislation (it is held) rather implying "stability and fixity" than inducing change and growth. But the success of the Elizabethan legislation (judged by the result) is one of the best evidences of the necessity of Dr. Cunningham's historical method, which examines the requirements of each age, and tests the sufficiency to that end of remedies proposed and enforced. The legislation of the Elizabethan times was not rigid, but flexible, allowing for modification. "The whole experience of many years of tentative legislation was gathered and embodied in a great system of national commerce and industry ; Parliament did not merely lay down a set of hard and fast rules, but created a national machinery for the regulation of industry and commerce," with such success that only slight modification was needed for its working during the seventeenth century and the greater part of the eighteenth. Creeds and systems have their day : if the Mercantile System (in the broad view which Dr. Cunningham takes of it) secured the supreme objects which Elizabethan statesmen aimed at—a high position for England abroad and social order at home —then must current conceptions of the vice of the system be duly tempered by reference to the actual needs and the practicable and actual remedies of the times during which it flourished. The same historical regard for the relativity of measures and of ideas as their antecedents is conspicuously evinced by Dr. Cunningham in his estimate of the effects of Puritanism. The baleful influence of Puritanism as a forced and spurious product has not escaped historians ; but it has been reserved, we think, for Professor Cunningham, among English writers, to animadvert with scathing precision on the effects which the Puritan rule of life entailed on the industrial and commercial life of the nation. By allusions such as the preceding—which, though introduced incidentally, are essential to his theme—as well as by the more continuous treatment of that theme itself, the value of this work is sustained throughout. One of its most interesting and successful features is the scholarly presentation of contemporary economic theory in illustration or in criticism of economic fact. It may be some time, as we have already implied, before the results of the labours of Dr. Cunningham, and of other toilers in the same rich field, penetrate into the every-day text-book of the school, and elevate the ordinary conception of history ; but when that day comes, it will be brighter for the student and better for all. Meantime, we recommend the present volume as an interesting and able work.

The Colonial Era in America. By George Park Fisher, D.D., LL.D., Professor in Yale University. With Maps. London : Sampson Low, Marston, and Co. (Limited). 1892.

Dr. Fisher's *Colonial Era in America* is announced as the first of a series of four volumes which are intended to furnish in brief form a readable and trustworthy history of the United States from the discovery of the Western Continent to

the present time. The entire work is to be produced on the co-operative principle. That is to say, each volume is to be the work of a separate author, and is to be complete in itself. There is undoubtedly room for such a work. The general histories of Bancroft, Bryant and Gay, and Hildreth are already out of date; while Ridpath's popular history is scarcely trustworthy in respect of accuracy and completeness, and George Tucker's volumes are written from a Southern point of view, and have a partisan character.

Judged by the first volume, the present project is very promising. Dr. Fisher evidently possesses many of the qualifications of a thoughtful and reasonable historian, in accordance with modern ideas. He is painstaking in matters requiring honest research; he is fair in judgment and generous in his sympathies, though his efforts to defend the New England Puritans against charges of intolerance are not always successful.

The book consists of two parts, the first extending from the discovery of America to the English Revolution of 1688, and the second from that event to the French War of 1756. Within these limits, the history of each of the colonies is traced separately, a mode of treatment which is warranted by considerations both of time and of circumstance, and which is very successfully carried out. But scant justice is done to the geographical aspects of the subject. The physical geography of the North American continent is dismissed in three pages, which condense the familiar contrast between the old world and the new, and between the Atlantic and the Pacific seaboard of the latter. Other six pages are devoted to the history, the language, and the customs of the aboriginal Indians (so called) of North America. Notice is taken of the delimitation of the boundaries of the original colonies. There are three maps, one of which illustrates the physical features of the continent, while a second exhibits the original grants, and the third shows the colonies as they were in 1755 on the eve of the French War. The volume is therefore weak in its geographical bearings.

We learn with some anxiety that Dr. Fisher, following recent inquirers, rejects as apocryphal the romantic story of the interposition of the Indian Princess Pocahontas to save the life of John Smith, the Virginian pioneer. According to Dr. Fisher, the incident was not noticed in Smith's *True Relation of Virginia*, published in 1608, and it appeared for the first time in his *Generall Historie*, of 1624, which was embellished by this and other sensational interludes of very doubtful authenticity As regards style, Dr. Fisher's book must be commended on account of its directness and simplicity; but it is neither eloquent nor very striking.

British New Guinea. By J. P. Thomson, F.R.S.G.S., etc. With Maps, numerous Illustrations, and Appendix. George Philip and Son. Pp. xviii. + 336.

It is no disparagement to Mr. Thomson to say that, with the exception of parts of the appendix and the embellishments of a too fluent style, the greater part of his book is familiar to those who have studied the very able and interesting reports of Sir W. Macgregor. For the general reader, however, it is undeniably useful to have the matter of these reports and the narratives of various recent travellers reduced and digested into a single volume. Unfortunately, the survey of the territory is far from complete, and more than one important addition has apparently been made since Mr. Thomson closed his record. Thus, the Hornby Range, which appears on his map, has lately been shown to be not an independent range, but merely spurs of Mount Suckling. Then the great affluent of the Lower Fly, on its northern side, the Bamo, is not alluded to, and the whole region lately explored between the Fly and the Aird rivers is noted by him as "unexplored." We

should be loth to urge this as a reason why such a book as the present is a little premature; but it leads us to suggest that, in addition to the treatment of the subject from, so to speak, a gazetteer point of view, it would have been well to deal more fully with such general questions as planting and trade, and especially finance, which has all along been a pressing difficulty for the Administration. However, for those unfamiliar with the subject, the book contains much interesting matter, both in connection with native life and customs and in details of the adventures of different expeditions.

Very little is even now known of the interior. The Fly River, as most of our readers know, has been ascended more than once for upwards of 600 miles, but without bringing back as much general knowledge of the country as might be expected. The tide ascends 150 miles, and for a much greater distance not a stone is seen. The country is evidently all under water at certain seasons, the inhabitants living, necessarily, a wandering life, and probably subsisting mainly by the chase. But, however unpromising the country—which has already been described, so far as our knowledge goes, in this journal—there is no doubt of the interest of the explorers' voyages, the leading features and incidents of which have been well put together by Mr. Thomson. He mentions, as one of the most important recent discoveries, a large river named the "Morehead," flowing into Torres Straits near our western frontier, and possibly affording access to the still unknown interior of that region.

We think the author is premature in asserting that Sir W. Macgregor has "discovered the volcanic character of Mount Victory." Sir William, from a distance of 12 to 15 miles, observed columns of steam ascending from certain points. These, if his observation was correct, may prove the existence of hot springs, but not necessarily of a volcano.

The natural history appendices to the volume are of considerable interest.

Asien. Eine allgemeine Landeskunde. Von Professor Dr. Wilhelm Sievers. Leipzig und Wien: Bibliographisches Institut, 1892. Pp. viii + 664. *Price* 15 *M.*

Those who are acquainted with the author's former compendium, *Afrika*, which was reviewed in vol. viii. p. 629, will heartily welcome the appearance of this new work. Whatever expectations they may have formed will not, we believe, be disappointed. The information is full, accurate, and well-arranged. A sketch of Asiatic exploration from the earliest ages down to modern times is followed by an excellent description of the configuration of the continent. Its vast area and immense mass are thrown into proper relief by figures and comparison with other parts of the globe, its orography and hydrography are carefully delineated, and the information hitherto acquired concerning the geology is collected. The sections treating of individual parts of the continent are full of information conveyed in a concise and yet attractive style. Of special interest at the present time is the description of the Pamir, which gives the impression that this region contains, as Mr. Mitchell maintains in his article in vol. viii., numerous broad valleys, where cattle now find rich pasturage, and which might be cultivated to advantage.

In the latter half of the book are chapters on the races that inhabit the Asiatic continent, and on the fauna and flora. Of course in a work of this description there is no space to enter into the discussion of complicated ethnological questions, and Dr. Sievers wisely refrains from any rash statements, confining himself to a general account of the physical characteristics and the habits of the various tribes. With

regard to the fauna or flora, each region is surveyed in detail, special attention being given to the Eastern Archipelago with its many peculiarities. As in other parts of the volume, the information obtained by the most recent travellers is utilised ; thus we find mention made of the wild horse of Dzungaria, discovered by Przhevalski, and named after him. We are surprised that no account is given of the water-fauna beyond a mere enumeration of *trepang*, seals, corals, etc., in the chapter on *Nutztiere*, and a casual allusion to the fresh-water seals of Lake Baikal in the geographical part of the book.

The printing and general get-up of the work are very good, and the excellent illustrations are a great acquisition. The chromo-lithographs are particularly delicate in shading and tint. Nor should the maps be forgotten, many of which are reproductions from Berghaus' atlas : they are finely executed and agreeably coloured.

A History of Peru. By Clements R. Markham. Chicago : Charles H. Sergel and Co., 1892. Pp. xvii. + 556. *Price* $2.50.

It is difficult to render a large part of the history of Peru attractive. From the time of the Spanish conquest, almost up to the present day, it consists of a series of wars attended with cruel massacres, waged first between the Spanish conquerors and their successors, and afterwards with the mother-country, and ending with the unjustifiable and brutally conducted invasion of the country by Chile. A few bright gleams are thrown over the picture by the presidencies of Castilla and Pardo and the heroic conduct often displayed by the Peruvian patriots, as, for instance, in the defence of Tarapaca and in the gallant deeds of Admiral Grau of the *Huascar*. Mr. Clements Markham has not, however, dwelt longer than was necessary on the unhappy internal dissensions of the country and her struggles against foes without. He notices each step made towards material and intellectual progress, and devotes the four concluding chapters and the appendices of his work to a description of the present state of the country, its people, trade, literature, etc. A rather fuller account might, perhaps, have been given of Inca civilisation, which, we are inclined to think, Mr. Markham estimates too highly. It was, certainly, a wonderfully perfect system—so perfect that it controlled every action and left no room for individual initiative. A people more advanced in intellectual development than the Incas would not consider the regular supply of creature comforts, which this system guaranteed, a compensation for total loss of liberty.

The volume is well printed and adorned with good illustrations and some useful maps. There are a few printer's errors and a mistake in the numbering of the pages.

Albuquerque. By H. Morse Stephens, Lecturer on Indian History at Cambridge, Author of a *History of the French Revolution*, etc. ("Rulers of India" Series.) Oxford : At the Clarendon Press, 1892. Pp. 222. *Price* 2*s.* 6*d.*

It is only in a very wide sense of the term that Albuquerque or his successors can be counted Rulers in India. The Portuguese never occupied more than a small portion of the outer fringe of the country, and the internal organisation and government remained unaffected by their presence. But they produced a great and far-reaching change in its external relations. They first opened up India to the influence of European Powers ; their policy compelled the Dutch and the English to become their imitators and rivals, and so led to the formation of the East India Company and all that has followed therefrom to produce the India of

to-day. To understand the action and methods of the English traders demands some acquaintance with the proceedings of their predecessors. For this purpose Mr. Stephens' work supplies all that is needed ; and though at times there is rather a superabundance of detail, it is on the whole a valuable and interesting contribution to the history of India. While he has told briefly the rise and fall of Portuguese dominion in the East, his work is mainly occupied with the career of Albuquerque and the strong character it reveals. The picture drawn of his striking personality is a very attractive one, and leaves the distinct impression of a man of great courage, tenacity of purpose, and nobility of character, who, if he had in him something of the buccaneer, was also a man of statesmanlike views and aims.

Borneo: its Geology and Mineral Resources. By Dr. Theodor Posewitz. Translated from the German by Dr. Hatch, F.G.S. London : Stanford, 1892. Pp. 495. With maps and illustrations.

The reader who takes up this book in the hope of meeting with anything like a complete account of the geology of Borneo will be disappointed. Large areas of the island are geologically and even geographically unknown ; and although many journeys across the interior have been made by Dutch explorers and others, the geological information they have been able to bring back is, to say the least, somewhat meagre. Dr. Posewitz has spent three years in Borneo, and his knowledge of Dutch has stood him in good stead, for he provides us with an excellent digest of all that has been written in that language concerning the geology of the island. Nor is our author less well acquainted with the contributions to the subject which have been made by English, German, and other writers. He has thus been able to produce a more or less satisfactory first sketch or outline of the geology of Borneo. The "mountain-land" is described as being made up largely of crystalline schists and overlying slates which may be of Devonian age. With these are associated various eruptive rocks. Strata of Carboniferous age and Cretaceous beds have also been detected in the same region, the highest elevation of which appears to be Kina-balu, which rises to 13,698 feet. The "hill-land" forms a belt of isolated ranges, rarely exceeding 200 to 300 feet, which circles round the "mountain-land," and appears to consist exclusively of rocks of Tertiary age. The "plains" are flat lands covered by sheets of sandy clay and conglomerate; while the "marshes" are composed of recent marine and fluviatile deposits. Up to the beginning of the Tertiary period, Borneo existed as an archipelago of small island-groups and larger islands. In the seas surrounding these islands the sediments of the Tertiary period were accumulated, and by-and-by much of the shallow sea-bed became land, and the islands were thus united as a whole. Broad, shallow gulfs, however, penetrated the island in some places, but these eventually gave place to dry land, and now form what our author calls the plains. A large part of the volume is occupied with an elaborate account of the "useful minerals" of Borneo. From the Tertiary strata coal might be obtained in considerable quantity ; much of it is a poor lignite or brown coal, but a better variety ("pitch-coal") occurs plentifully. Auriferous quartz appears in veins in the "mountain-land," and is obtained also from drift and alluvial deposits. Diamonds, which form the chief and most valuable product of the island, are found in alluvia, the sands of rivers, and the drift or "diluvium" of the "plains," but have not yet been detected *in situ*. Platinum and ores of antimony, mercury, iron, copper, silver, lead and zinc, tin, arsenic, manganese, etc., have been obtained ; and the presence of rock-salt is suggested by the occurrence in several localities of brine-springs and salt-marshes. This looks as if Borneo were tolerably well supplied with valuable mineral products. But hitherto the results of prospecting have offered no great

encouragement for mining operations. Gold-bearing veins and copper ores occurring *in situ* have not been worked to profit, and the same seems to have been the case with the attempted exploitation of the ores of iron, manganese, lead, and mercury. Indeed, it would appear that the only mineral product of Borneo that can be profitably mined at present is coal. Dr. Posewitz, however, thinks it likely that alluvial gold and diamonds may yet be made to pay, as certain wide alluvial deposits have been shown by recent investigations to be in great part undisturbed. We need only add that, although this work contains a necessarily meagre account of the geology of the island, yet those who may be desirous of obtaining information as to its mineral resources will find in these pages an admirable digest of all that is known. To future explorers it will also be of the greatest aid, since it brings into one view everything that has been written concerning the physical geography and geology of Borneo. Dr. Hatch has added a few useful explanatory footnotes; but he has omitted to give an index—an unpardonable omission in a work of reference.

The History of the Moghul Emperors of Hindustan illustrated by their Coins. By Stanley Lane-Poole. With a Map. Westminster: Archibald Constable and Company, 1892. Pp. clxxvii., and Index.

Mr. Stanley Lane-Poole has done well in reprinting these pages from his *Catalogue of the Coins of the Moghul Emperors of Hindustan in the British Museum*. He hopes they may be of use to historical students who are not specially numismatists. This edition consists of one hundred copies.

It will suffice if we describe its contents. About a fourth of it consists of a concise historical outline, with a genealogical tree, of the Moghul Emperors. It contains an admirable account of the rise and fall of the Moghul Empire, and gives prominence to any features in the history which are of numismatic importance. The succeeding chapters are on the cabinet of Moghul coins in the British Museum, with a summary account of the collections and donations which have contributed to its formation and wealth; the mint cities, which furnish a faithful chart of the growth and extent of the Moghul Empire; eras, regnal years and Persian months; inscriptions, titles, weight, etc.; images and zodiacal signs; nisars, or presentation money; copper coinage; coinage of the East India Company; local coinage; list of dated coins of the Moghul Emperors in the British Museum; Moghul mints in the British Museum; honorific epithets of mints; Persian distichs and quatrains on Moghul coins in the British Museum; comparative table of Hijrah and Christian years and months. This table is adapted from Wustenfeld's *Vergleichungs-Tabellen*, Leipzig, 1854. It extends from 1525 A.D. to 1806. The map is of mediæval India, illustrating the mints of the Mohammedan rulers.

The Barren Ground of Northern Canada. By Warburton Pike. London: Macmillan and Co., 1892. Pp. 300. *Price* 10*s.* 6d.

In his preface, Mr. Pike tells his readers the object he had in journeying to and wandering over one of the bleakest and most uninteresting regions on the face of the globe, or, as he describes it, "a howling desolate wilderness;" had he not thus early told us what he had in view, we should not easily have discovered it.

During his eighteen months' absence from civilised life he made no addition of any consequence to our limited knowledge of the geography of those northern regions, as he did not carry about with him even a chronometer or a compass. The expeditions—for there were two—were undertaken simply "to see and find out the habits of the musk ox, a strange animal, a relic of an earlier age, still to be

found roaming over the vast desert between Hudson's Bay, the eastern ends of the three great lakes of the North, and the Arctic Sea."

After a reconnaissance the first season, he started a second time from the Hudson Bay station, Fort Resolution, on the south of the Great Slave Lake; and he managed, after many difficulties and much suffering, to get as far north-west as the northernmost bend of the Great Fish River, returning by a southern route. Maps of those regions are not much to be depended on, but he seems to have travelled in all some 1200 to 1500 miles.

Starting with a certain amount of food, tobacco, and tea, the party had soon to depend on their guns and their fish-hooks and nets, till they reached the track of the caribou and afterwards that of the musk ox, when slaughtering and gorging became the order of the day.

Sport there was none; on the first excursion, "September 24th was a red-letter day, marking the death of the first musk ox." "A single bull walked directly towards us. In crossing an occasional piece of level ground he walked with a curious rolling motion, probably accounted for by the waving of the long hair on his flanks; this hair reached almost to the ground, and gave the legs such an exaggerated appearance of shortness that, at first sight, one would declare the animal to be incapable of any rapid motion. The shaggy head was carried high, and when he finally pulled up within forty yards, with his neck slightly arched, and a gleam of sunshine lighting up the huge white boss formed by the junction of the horns, he presented a most formidable appearance." "My first shot settled him."

From this extract, it can easily be understood how Mr. Pike and his Indians could kill hundreds of both musk oxen and caribou at a few yards' distance, the animals sometimes taking no notice of the report of the guns. He mentions one occasion when the caribou, crossing a river, were caught by Indians in seven canoes, and their spears were kept going till 326 carcases were hauled ashore, and 200 of these allowed to rot in the shallow water.

The most thrilling part of Mr. Pike's narrative is the description of the perils and starvation he went through in an attempt to reach Macleod's Lake, in British Columbia, on his way home; he ascended the Peace River to its head waters, and then meant to run down by the Fraser River to Quesnelle; but after having wandered about for some days trying to find the way, the party, consisting of Mr. Pike, a Scotch Highlander servant of the Hudson's Bay Company, and three natives, had to turn back, and reached the hut of a white man after an absence of thirty-two days, having subsisted for many days on scraps of moose skin and one spoonful of flour.

The story is well told, but the subject is not one of much general interest. The outline map of the Dominion given in the appendix would have been of much more use had it given the names of the principal places mentioned in the narrative, with a line marking his route.

Henry Martyn, Saint and Scholar; First Modern Missionary to the Mohammedans, 1781-1812. By George Smith, C.I.E., LL.D. With Portrait and Illustrations. London: The Religious Tract Society, 1892.

This volume ought to appeal to a wide circle of readers. Dr. George Smith has had the advantage of a large access of new materials in recent years, and has made good use of them to draw a vivid portrait of Henry Martyn's character. The lives of saints, as commonly written, have few attractions for some tastes; but this life of Henry Martyn is the history of an earnest, noble soul, written with sincerity. Henry Martyn was not strictly a missionary. In virtue of his office, he was a chaplain of the East India Company; but the missionary spirit was the domi-

nant motive of his life, and in virtue of this spirit his life has proved a powerful influence in the lives of others. Dr. Smith has written with due regard for this important aspect of Henry Martyn's life and historical position. The pages are remarkably free from the vices which frequently disfigure missionary biographies. A most interesting account is given of Henry Martyn's labours as a translator of the Bible into Hindustani, Persian, and Arabic. His work has now been either superseded or entirely revised; but his efforts are historically memorable, and are here duly commemorated. We should have liked to see a map, as a worthy accompaniment to the text.

The Student's Handbook of Physical Geology. By A. J. Jukes-Browne, B.A., F.G.S. Second Edition, revised. London: Bell and Sons, 1892. 8vo, pp. 666. *Price 7s. 6d.*

That this *Handbook* should have reached a second edition shows it meets the wants of a certain class of students. It gives, indeed, a satisfactory representation of the science as a whole—the descriptive portions being generally well done. Some of his statements, however, surprise us. Thus, he remarks that no one has compared our boulder-clays with the ground-moraines of Switzerland "with the view of indicating points of difference or resemblance." From this it is obvious that the author has never seen the Swiss ground-moraines himself, and is ignorant of much that has been written by others upon the subject. He also informs us that no boulder-clay has yet been observed in the Arctic regions, although there are excellent accounts of the ground-moraines of Greenland by Dr. Holst and others, who describe these as being of precisely the same character as our boulder-clays. But it is in the discussion of theoretical questions that Mr. Jukes-Browne comes short of what one expects a good teacher to be. His critical remarks are often singularly inept; and in the treatment of the higher branches of his subject he betrays feebleness of grasp and lack of imaginative insight. Of this the author is necessarily quite unconscious. But had he been aware of his limitations he would have shown less cocksureness in the expression of his opinion upon controverted questions. It is only fair to say, however, that as the greater portion of the volume deals with the description of geological agents of change and the structure of rock-masses, the author is not often tempted to stray beyond beaten tracks. Along these he plods carefully, if somewhat heavily; and we have no hesitation, therefore, in commending his book as a tolerably accurate and painstaking compilation of physical geology.

The Building of the British Isles: A Study in Geographical Evolution. By A. J. Jukes-Browne, B.A., F.G.S. Second edition, revised. London; Bell and Sons. 1892. 8vo, pp. 465. *Price 7s. 6d.*

This is an ambitious attempt to trace the changes that have taken place in the distribution of land and sea within the British area during geological times. The work is characterised by the same merits and demerits as the author's *Handbook of Physical Geology*, mentioned in the preceding notice. Mr. Jukes-Browne can describe the data with which he himself is more or less familiar, and seldom quite misses their obvious meaning. Simple geological structures he can elucidate without difficulty, and his reconstructions of the geography of the Mesozoic and Tertiary periods are as a rule satisfactory. He is less at home, however, in dealing with the complicated structures so frequently encountered amongst the older rocks of Britain, and his interpretations are correspondingly untrustworthy. The reconstruction of Palæozoic geography calls, in fact, for a better knowledge of the facts than Mr. Jukes-Browne has at command, although he has evidently spared no pains

to become acquainted with what has been written upon the subject. The author points out that the evidence derived from the Palæozoic system is necessarily less complete than that obtained from the systems of later age. This is certainly true, and is one reason why his reconstructions of Palæozoic geography are less satisfactory than the others. But if the data upon which our author's sketch-maps of Mesozoic and Tertiary geography are based be copious enough, still more abundant are the facts relating to Pleistocene and recent times. He ought, therefore, to be able to produce a yet fuller and more satisfactory account of the geographical changes of those later stages; but, unfortunately, the very abundance of the materials has proved too much for the author. He is not only behind date as to his facts, but his discussion of the evidence, so far as that is known to him, is crude in the extreme. The questions raised require for their treatment a wider knowledge, a greater grasp, and deeper insight than he appears to possess. The narrowness of his purview is specially conspicuous in his treatment of the "theory of the permanence of continents and oceans"—a subject which he would have been well advised to leave alone. Notwithstanding these shortcomings, however, his book is well worthy of perusal. It brings together many scattered facts, and gives the reader a general idea of what a geologist means by geographical evolution. It is illustrated by a number of outline-maps showing the supposed distribution of land and water at successive periods of the past.

Uganda: Its Story and its Claim. A Handbook for the present Crisis. By the Rev. G. Furness Smith, M.A. London: C. M. S., Salisbury Square. Pp. 60. Illustrated.

Partisan literature is not always good reading; but, in the present case, we can recommend the publication under review. The pamphlet will be read by numbers with great interest; it is accurate as far as it goes, but the author has omitted to mention much which might easily have added to its value.

Four Years in Upper Burma. By W. R. Winston. London: Kelly, 1892. Pp. 266. With Illustrations.

Although this is not definitely stated, the author is a missionary. He has given a readable and accurate account of Burmah. The book is admirable in every way, more especially because the author does not obtrude his identity. We conscientiously recommend it. The illustrations are excellent.

The Amazon and its Wonders. By the Author of *The Arctic World*, etc. Pp. 207. *California and its Wonders.* By the Rev. John Todd, D.D. Pp. 208. London, Edinburgh, and New York: T. Nelson and Sons, 1892. *Price 1s. 6d. each.*

These two small volumes should prove of interest to the young. As they are handsomely bound, clearly printed, and profusely illustrated, they ought to make useful and welcome gifts, very suitable for the present season. Both contain a considerable amount of information, conveyed in a pleasant and clear style.

Elementary Physiography, or Earth Lore. Adapted to the latest requirements of the Department of Science and Art. London: George Gill and Sons. 1892. Pp. 264.

In Gill's *Elementary Physiography* the subject is treated very systematically. A great amount of matter is compressed within a small space, and the definitions and descriptions are expressed with admirable clearness and accuracy. The diagrams and illustrations are well drawn and well printed, and they add greatly to the value of the little book.

Illustrations of Indian Field Sports, reproduced from the Coloured Engravings published in 1807. By Captain Thomas Williamson, of the Bengal Army. Westminster: Archibald Constable and Co. *Price* 10*s.* 6*d.*

The original edition of this work consisted of forty coloured plates, with descriptive letterpress to each, and in olden times these sporting pictures formed the favourite adornment of the Bengal subaltern's rooms. In the present day, it would look comical to see tiger-slayers and pig-stickers fearfully and wonderfully got up like Newmarket jockeys; there is however much, both in the pictures and in the letterpress, to remind Indian Nimrods of happy bygone days.

The Handbook of British Honduras, for 1892-93. By Lindsay W. Bristowe. W. Blackwood and Sons, 1892. Pp. 272 and Index.

For conciseness, as well as accuracy, we can recommend this volume. It is rare to find so much information compressed into so small a space. A few pages might, perhaps, have been omitted with advantage, for it is hardly necessary in a Handbook of British Honduras to mention the rulers of the chief countries of the world. The map is, however, good, and the author is to be congratulated upon his work.

Hazell's Annual for 1893: *A Cyclopædic Record of Men and Topics of the Day.* Eighth year of issue. London: Hazell, Watson, and Viney, 1893. Pp. 740. *Price* 3*s.* 6*d.*

Every year further additions are made to the vast stores of information contained in this useful *Annual*. Among the new subjects treated of in the present volume are Bimetallism, State Pensions, Land Nationalisation, and other social questions which have of late sprung into prominence. The Pamirs, Uganda, and the reclamation of the Zuyder Zee, are articles which will have some interest for geographical readers.

Schetsen uit Insulinde. Door E. Nijland. Eerste Aflevering. Utrecht: C. H. E. Breijer, 1892. Pp. 32.

These sketches are written to accompany a map issued by the Comité voor Nederlandsche Zendings-Conferentien, and therefore mission work occupies the principal place in them. There is, however, besides, a great variety of interesting information, the author's object being to portray the condition of the natives in all its different relations to the land, the government, industries, and the physical features of the country. The work can hardly be judged from a single number, especially as regards its arrangement, but we can say that the style is agreeable, and the matter attractive. The illustrations are also good.

Almanach de Gotha: annuaire généalogique, diplomatique et statistique. 1893. Gotha: Justus Perthes. Pp. xxiv + 1267.

This most useful publication appears for the one-hundred-and-thirtieth year, and with some improvements on preceding editions. At the sacrifice (easily afforded) of two chapters of the Appendix, dealing with the precious metals and with the year's events, the editors have made such additions to the genealogical section as afford a clearer and more extended view than was hitherto presented of the genealogies of families, and also, indirectly, of the history of states. The diplomatic and statistical information, including facts and figures bearing on the army and the navy, is, of necessity, brought down to date. The large space assigned to commercial statistics is noteworthy. Throughout, one cannot but recognise success in the acquisition of facts and skill in their arrangement. Yet in

a work so comprehensive, inaccuracies are hard to avoid; nor would it be easy to distribute the censure fairly among the many concerned in its publication. One expects such a work to be rigidly accurate in treating of the *personnel* of its purview; and yet, to limit ourselves to a few of the many pages devoted to Great Britain, we find the Chancellor of the Exchequer's office excluded from those which are dependent on party changes (p. 857), and mis-spellings like the following: King[s]burgh (p. 858), Selbourne (p. 858), Porte (for Poste, p. 859), Mat/hew (p. 866), Kylbachy (p. 870), and Kincarnay (p. 870). Such mistakes impair full confidence in matters of greater moment. We notice many *lacunæ* which might be filled in. Excellent portraits are given of the King and Queen of Wurtemberg, the Grand-Duke of Hesse, and the Khedive.

Rulers of India. Lord Lawrence. By Sir Charles Aitchison, K.C.S.I., M.A., LL.D., formerly Lieutenant-Governor of the Punjab. Oxford: At the Clarendon Press, 1892. Pp. 216. *Price* 2*s.* 6*d.*

In this monograph, Sir C. Aitchison has kept prominently in view the object and scope of the series to which it belongs. It is the career of Lord Lawrence as a ruler in India, his aims, guiding principles, and achievements, that he has aimed at describing. Of the personal life, only so much has been told as throws light on his character as ruler, or is inseparable from the story of his career. The task he undertook has been accomplished with signal success. The work is admirably proportioned: the narrative is animated and vigorous: the exposition of the administrative problems Lawrence had to deal with, while given with the accuracy and precision to be expected from one who himself played no inconspicuous part in Indian affairs, is clear and interesting, while not wanting in grace and ease of style. In short, this is one of the most valuable of the series of monographs on Rulers in India both for students of Indian history, and for those who are engaged in the administration of the country. Sir C. Aitchison, when describing Lawrence's early career, says that he belonged to a class of district officers for whom there is no longer any room in our more elaborate and highly organised system of government in India. There is too much truth in this statement. The tendency of legislation in recent years, from over-anxiety to guard against the abuse of large powers, has been to fetter the district officer by restrictions, the effect of which is to render him nearly as powerless for good as for evil, and to convert him into a mechanically working and lifeless instrument. A study of Lawrence's administration as chief commissioner in the Punjab might have pointed to a better way than this, and shown that the proper and sufficient check is not the curtailment of power, but the selection and appointment, as governors, of men who will work in Lawrence's spirit and make others do the same. "The chief commissioner," it is said, "knew his men. For honest mistakes there was toleration; for idleness or the incompetence of ignorance there was none. Every man was required to know his work, and to do it, and to see that the man under him knew and did it too." But though, unfortunately, the contrary policy has been followed, even so the fact remains that however fettered a district officer may be, his position is one in which personal character has room to assert itself, and to exert an influence among a people so quick as that of India to recognise and submit to a true man. There is still room for men who have something of Lawrence's strength of character and who work in his spirit, and such men may even now, by throwing their heart into their work, exert an influence for good. It is to be hoped that others will be inspired by the example of Lawrence, with the desire of acquiring such a personal influence as he exercised, and this sketch of his career is well fitted to stimulate it.

NEW MAPS.

EUROPE.

SEINE, Carte hydrologique du Bassin de la ——, établie d'après les travaux de M. Belgrand. *Annales de Géographie, Oct. 15th*, 1892.

NORD-DEUTSCHLAND, Florenkarte von ——, für das 12.-15. Jahrhundert. Massstab, 1 : 3,700,000. Entworfen von Dr. Ernst H. L. Krause.
Petermann's Geogr. Mitteilungen, Jahrgang 1892, *Tafel* 18.
Gotha: Justus Perthes.

DEUTSCHEN REICH, Die Reste des friesischen Sprachgebiets im ——. Nach den neuesten Forschungen entworfen und gezeichnet von Paul Langhans. Nordfriesland, 1 : 400,000. Helgoland, 1 : 200,000. Wangeroog, 1 : 200,000. Neu Wangeroog-Saterland, 1 : 400,000. Übersicht der Verbreitung der friesischen Sprache im Deutschen Reich. 1 : 2,000,000.
Petermann's Geogr. Mitteilungen, Jahrgang 1892, *Tafel* 20.
Gotha: Justus Perthes.

AFRICA.

AFRIKA, Spezial-Karte von ——, im Massstabe 1 : 4,000,000 (10 Blatt), entworfen von Hermann Habenicht, bearbeitet von demselben, Bruno Domann und Dr. Richard Lüddecke. Lieferung v. und Supplement-Lieferung.
Gotha: Justus Perthes.

With the publication of the fifth part and the supplement, this new and revised edition is now complete. Section 4, "West-Sudan," by B. Domann, is almost an entirely new map, for recent French expeditions and surveys have added considerably to our knowledge. In Portuguese Guinea, Sierra Leone, Togo, and in the Niger delta the corrections have been very numerous owing to recent changes in the political boundaries. On Section 8, "Seengebiet," by Dr. R. Lüddecke, important alterations had to be made. The country between the Victoria and Albert Nyanzas has now been explored by Stanley, Emin Pasha, Dr. Stuhlmann, and P. Schynse. The outline of the Victoria Nyanza has also been much altered since the last edition. The whole of British East Africa has been based on the surveys of Ritter von Höhnel, with additions from the reconnaissances of Jackson, Gedge, Lugard, and Dundas. For German East Africa Dr. O. Baumann's surveys of Usambara and those of Dr. Stuhlmann have been used. For the Portuguese Province of Mozambique, the reconnaissances made by J. F. Last, between the Rovuma and the mouths of the Zambesi, has been carefully worked in. The Stevenson Road Country has been compiled from the maps by Ravenstein, H. H. Johnson, and Kerr Cross. The supplement contains a hypsometrical and an ethnological map of Africa, which are designed by H. Habenicht.

NORTH AMERICA.

UNITED STATES, Geological Survey of the ——. J. Powell, Director.
Scale, 1 : 62,500.

Connecticut: Meriden, Norwalk.
Iowa—Illinois: Savanna.
Louisiana: Barataria, Quarantine.
Maine: Waterville.

Maryland: Annapolis, Brandywine, Drum Point, Owensville, Prince Frederick.
Maryland—Virginia: Montross, Wicomico.
New York—Connecticut: Stamford.
Pennsylvania: Dundaff, Honesdale.
Wisconsin: Milwaukee, Oconomowoc.

Scale, 1 : 125,000.

California: Smartsville.
Colorado: Canyon City, Lamar, Limon, Vilas.
Georgia—South Carolina: M'Cormick.
Kansas: Salina.
Kentucky: Richmond.
South Carolina: Abbeville.
Virginia: Appomattox.

COSTA RICA, Mapa Historico-Geografico de ——, y del Ducado de Veragua por D. Manuel M. de Peralta. Edicion especial para el IV° Centenario del Descubrimiento de America. *Madrid*, 1892.

This map has been specially prepared for the fourth centenary of the discovery of America. In its compilation the author has made use of almost all available data, ancient and modern. Unfortunately, Professor Pittier's last journey, in 1891, has not been incorporated in this edition. The map, which has been executed in the National Geographical Institute at Brussels, is very clear, and the hills are effectively shaded and printed in brown.

ATLASES.

HISTOIRE ET GÉOGRAPHIE, Atlas Vidal-Lablache, Maitre de Conférences de Géographie a l'école normale supérieure. 24 livraisons. 137 cartes, 248 cartons. Index alphabétique de plus de 40,000 noms. Livraisons, 15-17.
Paris: Armand Colin et Cie., Editeurs.

THE UNIVERSAL ATLAS, complete in twenty-eight parts, including Index. Parts xix., xx., xxi., xxii. *Cassell and Co., Limited, London.*

Like those previously issued, the maps in these parts are well drawn. There are, however, some defects in the map of Scotland: the county boundaries are not laid down as altered by the Commissioners, the only change being the combination of the names Ross and Cromarty. Important places like Crieff, Pitlochry, Oban, etc., appear in the same type as small villages and farms, the criterion used being the population. In the sheets of Australia the famous irrigation colonies on the river Murray are omitted, and the boundary of British Baluchistan in the map of India is not up to date. Part xvi. consists of maps of Southern India, Burma, and the Malay Peninsula, specially prepared for the English edition.

ATLAS OF COMMERCIAL GEOGRAPHY. By H. de B. Gibbins, M.A. 48 maps and 23 pages of explanatory letterpress. *W. and A. K. Johnston.*

This little atlas is designed to represent those geographical facts which are of most importance for commercial purposes, by bringing into view the principal commercial advantages and facilities of each country, as well as certain facts relating to climate and vegetation. A series of geological maps has also been inserted, with some explanatory remarks on "Commercial Geology," which the editor claims to have introduced for the first time into an atlas. Much useful information is brought within a very small compass, and the work will be appreciated both by students and by men of business.

140
English Miles
200 200 300 400
60
59
58
57
56
70
60
50
40
Sewards Glacier
Barrow
Halkett
Harrison B
Camden B.
Mackenzie B.
Pt Manby
C. Bathurst
Franklin Mts
C. Phillips
Porcupine R.
Fort Good Hope
Fort Norman
Peel R.
Mt Tarn
Mt Edziza
Stikine R.
Fraser R.
Fort Simpson
Fort Essington
Pt Charlotte
British Columbia
Vancouver Island
Fort Rupert
C. Flattery
Victoria
Mt Olympus
Olympia
Washington
Astoria
Columbia R.
Portland
Salem
Oregon
Umpqua R.
Empire City
C. Blanco
Fort Lyton
Westminster
Lytton
Klamath R.
Fort Shasta
C. Mendocino
Santa Rosa
San Francisco
Sacramento
Stockton
Monterey
Hastings
Valley Tree
Vesuvius
Fort Bidwell
Goose L.

The Edinburgh Geographical Institute

Geographical Magazine 1873

John Bartholomew & Co

THE SCOTTISH GEOGRAPHICAL MAGAZINE.

EXPLORATION OF THE RIVERS TANA AND JUBA.

By Commander F. G. Dundas, R.N.

(*Read at Meetings of the Society in Edinburgh and Glasgow, February* 1893.)

The river Tana, on the East Coast of Africa, the mouth of which is situated 100 miles north of Mombasa, was only partially known when, in March 1891, I was placed in command of an expedition formed by the Imperial East Africa Company to ascend this highway to the interior, and throw it open for commerce.

This expedition, consisting of three Europeans—Mr. Bird Thomson, Mr. Hobley, geologist, and myself—a crew of eighteen natives, and caravan of seventy Zanzibaris, safely crossed the bar at the mouth of the Tana, in the stern-wheel steamer *Kenia*, on April 1st, 1891 (the bar, as is always the case on the East Coast of Africa, is difficult to pass), and started up the river, which for some fifty miles was very narrow, with sharp, tortuous bends, where the vessel was navigated only with the greatest difficulty, on account of her size and the very strong current.

The tribe of the Wapokomo, who inhabit this district, and live upon the banks of the river, are of a quiet and timid nature, hard-working and industrious, growing large quantities of rice and other grain; they are very expert canoemen, almost living upon the water. During the rainy season the river overflows and floods the country over a large area, so that great difficulty was experienced in endeavouring to follow the course of the river, the vessel often being found some considerable distance away from the banks, manœuvring about amongst the trees.

The populous districts of Ndera, Subaki, and Masa were passed, the inhabitants of which fled into the forest at the sight of the *Kenia*, but were eventually induced to return, and, their fears allayed, they eagerly bartered food for cloth and beads. Then an unbroken stretch of dense forest extended for several days' journey on either bank; the foliage was thickly

covered with immense masses of creepers, which rendered it almost impossible to make a way through it from the river, and no sign of life, either of man or animal, was seen for this period. Emerging at length from the forest, we arrived in the district of Korokoro, and two days' voyage further on, the water shoaling rapidly and numbers of sandbanks appearing in the river, the vessel grounded continually. Finding ourselves then unable to proceed any further by water, we made the *Kenia* fast to the left bank near the small village of Hameye, the furthest settlement of the Wapokomo tribe, 350 miles from the mouth.

Two days after our arrival, the water had fallen so rapidly that it would have been impossible to have attained even this distance, had there been any delay. For one month the men were employed erecting a strong *Boma* and earthworks, for protection in case an attack should be made by the natives upon the vessel during my absence.

On August 17th I started with the caravan for Mount Kenia, following the course of the river, which had assumed a totally different character, falling over a rocky bed and at times assuming the force of a cataract. For several days our course lay through dense thorn-woods, over desert ground and grassy plains, at times crossing ranges of rocky hills. The countries of the Wadarobbo and Wadsagga were passed, and, though food was obtained from the latter, the people were treacherous and unfriendly; but no serious difficulty was experienced.

After marching several days in a dense forest, where our food-supply began to fail and no means of replenishing it could be found, we crossed the river by means of a raft from the right to the left bank, and arrived in the Mbe country. Here we left the river and steered direct for the mountain, some eighty miles distant and at times very conspicuous with its two snow-clad peaks. On entering the rich and fertile lands of Kikuyu, I met the inhabitants rushing about in a most excited state, exclaiming that the Masai (one of the most dreaded tribes in Central Africa) had arrived in their country on a raid, and were burning the villages and pillaging and carrying off everything. The route of the raiders was soon clearly discernible by the vast volumes of smoke that rose from the burning villages to the north-west. Continuing my course, which now lay along the crest of a range of hills, I suddenly perceived, about a mile off, in the valley below, a large force of Masai, comprising upwards of 700 warriors, armed with broad spears that glistened in the sun, and wearing the fantastic head-dress of skin which they don when on the war-path. They were marching in a serpentine formation in the direction from which I had just come. As my caravan numbered but two Europeans and sixty men, fifty of whom were porters and useless for fighting, as they would have bolted at once, I did not assume the offensive, knowing that in all probability, if attacked by the Masai, the caravan would have been annihilated. Accordingly, when the Masai by halting plainly showed that they had seen us, I spread out my men in skirmishing order, hoping to deceive them as to our numbers. These tactics apparently answered, as, after a short delay, they continued their march.

Proceeding onwards, I at length arrived at the foot of Kenia, which now, topped by snowy peaks, reared its majestic height in front of us, bearing due

north and presenting the appearance rather of a range of mountains than of a simple elevation. The valleys and open country all around were highly productive, and the richest which I had seen in Africa. Large fields of grain, with plantations of bananas and plantains, alternated with rich grassy fields and slopes divided by water-courses and rivulets that rushed from the mountain with the violence of torrents. Numbers of vegetables were to be obtained here from the natives—principally a large root called *Mbogo*, and very like a yam; and large flocks of sheep and goats were seen. Leaving the bulk of my caravan at the foot, I commenced the ascent of Kenia from the southern side, passing through dense forest, crossing deep ravines, and at length emerging from thick cane-woods at a height of 10,000 feet, near to the snow-line, where further progress was arrested by enormous ravines that descended almost sheer to a depth of about 800 feet. I observed the maiden-hair fern, forget-me-nots, and clover growing in profusion on the slopes, fostered by the moisture of the atmosphere, for the mountain is enveloped for days together in dense masses of cloud, which entirely screen it from view.

The ascent from the northern side is practically easy, the unbroken flank of the mountain rising by easy gradients from a plateau 2000 feet high.

On our return through the Mbe country, a most harrowing sight presented itself: what only a few days before were prosperous villages, standing amid fields of grain, were now smoking ruins: bodies of old men, women, and children, half-burnt, lay in all directions; here and there might be seen a few solitary individuals, sitting with their heads buried in their hands, hardly noticing the passing caravan, and apparently in the lowest depths of misery and despair. On questioning several of these unhappy beings, I was informed that the Masai had unexpectedly arrived one morning at dawn, spearing and burning all before them, and carrying off some 250 women and large herds of cattle. Only a few of the unfortunate people had escaped by flying to the mountains. I think one of the principal advantages to be gained by the construction of the Mombasa and Nyanza railway would be the opening up of these districts, which are now simply inaccessible, and hence are the scenes of these cruel outrages. Were it constructed, not only would these raids be stopped, but the country would be thrown open to trade and the sphere of Christianity largely extended.

Returning with the caravan to the vessel, which I found undisturbed, after an absence of nearly three months, I was enabled through the rising of water to start down-stream on November 1st: and although the passage was extremely difficult, through the narrow bends, the numberless snags, and the swiftness of the current, I recrossed the bar at the mouth of the river on Christmas Day, 1891, and succeeded in reaching Lamu, a port 50 miles to the northward.

The principal point ascertained in connection with the river Tana is that during the rainy season, when the river is in flood, it forms a route for small vessels of light draft, passing for a distance of 350 miles through populous and fertile districts, where ivory also is to be obtained, the trade in which now is almost entirely confined to a Swahili trader living at Kau.

After refitting the *Kenia* at Lamu, I set out for the Juba, having undertaken a similar expedition up this river for the Directors of the Imperial East Africa Company. The Juba discharges its waters into the Indian Ocean on the east coast of Africa, in lat. 0° 14′ S. and long. 42° 38′ E. Its lower course is in a southerly direction; the upper part of the river has not been explored.

It probably rises in the mountainous region of Abyssinia. Being the actual boundary between the British and Italian spheres of influence in East Africa, it is of considerable interest; as also in connection with the ill-fated expedition of Baron von der Decken, who in August 1865 ascended the river in his steamer, the *Guelph* (having lost one steamer on the bar at entrance), to the rapids above Bardera, where the vessel was wrecked, and the Baron with five Europeans was murdered by the Somalis, two only of his colleagues effecting their escape. No further details have ever transpired in connection with the fate of this expedition, for I am the only European who has been to Bardera since the catastrophe. The narrative of Von der Decken's expedition is well known; and I hope that during my recent voyage I have materially added to the present knowledge of the Juba as a highway to the populous districts of the Goosha territory and the rich tracts of the Boran country. Colonel Chaillé Long is reported to have made the ascent of the river for some 100 miles on behalf of the Egyptian Government; but, although Von der Decken's expedition was remembered and spoken of by the natives on the river, nothing was known of the visit of any other European.

Whereas the course of the Tana is almost entirely confined to the countries of the Wapokomo and Wakamba tribes, who are quiet and peaceful, the river Juba flows through the territories of the powerful and hitherto dreaded Somalis. The stern-wheel steamer *Kenia*, belonging to the Imperial East Africa Company, in which I made the ascent of both rivers, is 86 feet in length, with 23 feet beam, draws 2 feet 6 inches when laden, and has six compartments, with an upper deck, and deck-houses fitted with wire-gauze mosquito-frames, and an awning-deck above. The armament consisted of two new-pattern Maxim-Nordenfeldt guns.

We arrived off the bar from Lamu in tow of ss. *Juba* on 25th April 1892. This was the second attempt to reach the mouth, as the weather, through the unusual strength of the north-east monsoon, was very bad, and the vessel nearly foundered on the first occasion. We now succeeded in crossing the bar, which, owing to the necessity of exposing a vessel broadside on to the heavy rollers, is most difficult and dangerous. There is a depth of only one fathom at high-water, which varies but slightly with spring and neap tides. The numerous sharks and crocodiles about showed the fate we might expect should the vessel strike. Turning into the river from a north-east to south-west course in calm weather, we found a broad, majestic stream about 250 yards wide, with a current running 2½ knots, though at the narrow entrance it was much accelerated. The right bank was all low, with sandhills and a few bushes, while the left was wooded, and in the rear rose high red-sandstone hills, studded

with thorn bushes. On the bank were piled up trees and snags brought down by the current, and lying in masses extending some little distance from the river. Passing up in the *Kenia*, I arrived at Gobwen, a small village $2\frac{1}{2}$ miles from the mouth, having two very ancient Arab forts almost in ruins, one on either side of the river. On the left bank parts of the old wall which encircled the village and fort still remain. The only inhabitants now are the Kirobotos, natives of Muscat, some of the Sultan of Zanzibar's soldiers, who occupy the forts. Kismayu, the port for the river Juba, with a good protected anchorage, is ten miles south from the village of Gobwen, and is accessible at all times for vessels. A tramway could easily be constructed to connect these two places, the route for the most part traversing flat sandy soil, with a slight gradient at the river end, and thus products coming down the river might be transported to Kismayu for shipment.

The *personnel* of this, my second expedition, consisted of twelve Zanzibaris (the crew), one native Goanese engineer, one Hindu, one Chinaman (carpenter), twelve *Askari* (native undrilled soldiers), and fifteen native porters for cutting and carrying fuel.

I arranged to make a start up the river on May 2nd, but before that date received intelligence, from the Arab *akida* of the fort, that the Somalis were massing all round, and that evidently something was about to happen. I had noticed for several days that the hills in the distance were covered with black moving masses of natives. On the morning of the 2nd, having ordered steam at eight o'clock, I saw that both banks and the neighbouring hills were one black mass of Somalis, somewhat relieved by their white cloths; they were all armed with spears and the short stabbing knife which every Somali carries. Large bodies were to be seen moving through the bush and thorn-trees, chanting a kind of dirge, which, I understood afterwards, was their war-song. Presently my Arab *serang* rushed up to me on to the awning-deck, saying that all the crew had deserted. Then I noticed that two canoes filled with my men were arriving at the bank. When they had landed, the men knelt or grovelled on the ground before the Somalis, kissing their feet in abject terror. Of my caravan followers, encamped on the bank, all had bolted except the headman. Seeing several chiefs seated together under a thorn-tree, I landed in a canoe, and, going up to them, wished to know what was the cause of all this trouble, and why all these tribes had assembled. They informed me that I must take the ship out of the river, as no leave had been given for a vessel to come in. If I advanced with the vessel, they said, there would be war, and they would kill me. I learnt afterwards that 400 Somalis, concealed in thick bush, were stationed at the bend of the river, where the water was shallow, expecting the vessel to ground, when they would have attacked her.

Eventually, after a long palaver, I agreed to remain fourteen days, and they, on their part, promised to forward a letter from me to Murgan Usuf, the Sultan of the Ogaden Somalis, who was the head chief, and lived at Uffmadu, six days' journey from the coast. On the fourteenth day I received a reply from Murgan, saying that he was coming down to see me with a large following of 6000 men, and that I must feed them. I

replied that I should be glad to see him, but that, as I had no food, he had better leave his retinue behind him. I then went down to Mombasa to see Mr. Ernest Berkeley, the Administrator of the Imperial East Africa Company, who returned with me; and aided by his admirable administrative capabilities and untiring zeal and tact, I succeeded in concluding a peace with Murgan Usuf, who granted permission for the vessel to proceed. That gentleman, looking round the *Kenia*, espied my sword hanging in the cabin, and said he would have that as my present to him; he then quietly appropriated it, along with an arm-chair which he had taken a fancy to. He is a tall, powerful, handsome man, exceedingly sharp, and with a remarkable memory.

On July 23rd, having laid in a large supply of wood for fuel from the trees piled up at the mouth of the river, we started at 8 A.M. on the voyage up the river. For the first eight miles stretched large undulating plains, interspersed with woods and numbers of *Mkomo* (Fan palms) growing on the bank close to the water. The depth of the water varied from 2½ to 3½ fathoms. At noon I arrived at the first large Somali villages of Hadjowen and Hadjualla, situated nearly opposite each other, with populations of about 900 each. As we came alongside the right bank at Hadjowen, the natives crowded down to look at the vessel. The Somalis, as is well known, are a very fine, handsome race, of good physique, with well-formed features; the hair is very thick, and sticks out like a bush, but is parted in front.

The younger girls and women are mostly pretty, with splendid black eyes; they are jealously guarded by the males, and a *Mzungu*, or European, is hardly permitted to look at them. The Somalis are very strict Mohammedans. I noticed numbers of Galla slave-girls about, the different features and lighter colour marking them out from the Somalis, who are very black.

Leaving these, the only large Somali villages on the river from the mouth to Munsoor, 360 miles, and Bardera, 387 miles, I went on up the river. The country still showed large grassy plains, with occasional wood. Later in the afternoon, seeing large herds of game feeding, I made fast to the bank, and, going ashore, was fortunate enough to secure two *Topé*—a very large species of reddish antelope with sloping horns. The flesh was excellent, and provided us all with fresh meat for two days.

The next day, Sunday, we pushed on up the river, generally running through wooded reaches and jungle. Several times it occurred to me that there must be another river in the neighbourhood, the bends were so sharp and numerous. Seeing, as I thought, another river about a quarter of a mile off, running nearly parallel to the Juba, I landed and went over to it, when I discovered that it was the reach I had passed through just three hours before. This will illustrate how the river winds in this part of its course. At night, when the lamp was lit on the upper deck for dinner, the table and the deck overhead near the light were simply masses of insects of every description—large moths, beautifully marked, numberless extraordinary animals with gigantic feelers, earwigs, and gnats. As a rule, there was, I am glad to say, an absence of mosquitos.

Thick wood continued on both sides, with occasional openings, at which we saw numbers of natives of the Waboni tribe, who live chiefly by hunting. They are dressed with a piece of skin round the loins, and are armed with bows and arrows. The trees were full of monkeys of every description, from the smallest to the largest-sized baboons; they seemed to observe the vessel with some curiosity, but not to be in the least scared. Several white-headed eagles and numberless crocodiles were the only game to be seen, for the grass plains at the back were not visible. Numerous large snags in the river showing above the water, combined with a sweeping current, made the navigation somewhat difficult, more especially as I had to take all the angles at the different bends for the survey of the river, and occasionally anchor to ascertain the strength of the current with the patent log. Not one of the natives shipped as crew ever having been afloat before, I was obliged to be on the alert every moment when under weigh, and was never able to leave the steering-wheel.

As we ascended, the bends in the river took a wider sweep; and I observed clumps of the castor-oil plant, almost choked with an abnormal growth of creepers and undergrowth.

At 10 A.M. on the 25th we entered the Goosha district, the *Shambas*, or cultivated lands, commencing on the left bank. The population of Goosha some thirty or forty years back was solely composed of runaway slaves; but the inhabitants have increased to an enormous extent. Where formerly there were only a few villages, now there are numerous towns, extending almost continuously over an area of 100 square miles, with populations varying from 600 to 1000.

The people live entirely on the proceeds of cultivation. The clearings in the forest are first made by firing all the bush and lighting a fire at the foot of the trunk of each tree, which is left to smoulder. After a few days it comes down with a crash and a shower of sparks, and lies where it falls; but the land around is tilled and sown, mostly with *Mahindi* (Indian corn), which is the staple food. *Mtama*, *Sem Sem* (a small brown grain which is crushed for oil), cotton, and tobacco are also grown. These dead trees, which are to be found through the whole cultivated district for a distance of 100 miles, constitute a very handy supply of fuel for steaming. They are quite dry and burn admirably, in many instances not even requiring to be cut into lengths. I may add that from the mouth of the river to Bardera I never had to cut a single tree down for firewood.

On arriving at a large island, 28 miles in circumference, formed by the river forking, I was very perplexed as to which course to follow, and which was the river proper. At length I chose the north-east fork, which afterwards proved to be the right one, and arrived shortly after at the village of Mataku. I was here told that the other arm or fork joined the main stream again some distance further on, but that it was narrow and full of snags, with tortuous bends. However, on my passage down I navigated the other fork safely, thus accomplishing the circumnavigation of the island and obtaining information as to both channels. The arm of the river which I had taken was also most difficult to navigate.

In many parts it was only 15 to 20 yards wide, with dense overhanging trees and projecting branches; so that for several hours we were constantly colliding with the trees, the swift current sweeping the vessel in amongst them, and consequently the funnel and awning-deck ran great risk of being swept away. I may here add that whenever it was necessary to turn the vessel—which, be it remembered, was 86 feet in length with 23 feet beam—the bow or stern had to be thrust into the jungle, while the other end was left in the river exposed to the action of the current. It was an everyday occurrence for the vessel almost to disappear into dense masses of vegetation and creepers, which grow very thickly, and, hanging from the lower branches, make an almost impervious barrier.

After four hours' steaming we again joined the other fork, and the river then opened out to a breadth of 120 yards. The first large village on the right bank, Tula, was passed. The natives came out *en masse* to see the vessel go by, the women, as they ran along the banks, uttering low peculiar cries, commencing on a very low note and running up to the highest each lady was capable of producing. Several more elderly females, having three and four small infants tied up in the mother's cloth and secured round their bodies, careered along the banks, every now and then appearing at the openings in the high grass. How the young urchins escaped coming to grief, I cannot conceive.

We arrived at Fulyle, the village where the Sultan of the Goosha district, Nasibu Mponda, as he is called, resides. He is a tall, fine, powerful man, more resembling in his colour (which is a light brown) a Galla than a Swahili or Somali. On my arrival he at once came on board to visit me, expressing his delight at seeing the steamer. He begged me not to go to Bardera, as, he said, the up-country Somalis were very bad, and would assuredly kill me. He added that he and all his people throughout the whole Goosha district were friends of the European. The Swahili language is spoken as well as Somali.

From this village to Bilo there are numerous very large villages—in fact, small towns—densely populated, and all the banks are more or less cultivated, the cultivation extending in many instances to a distance of several miles on either side. Very little wood is now seen, the country being a flat plain, and excellently adapted for cultivation. Large groves of bananas and plantains were now of frequent occurrence, and as the *Kenia* moved along, hundreds of natives were to be seen at work in the *Shambas*. They nearly all dropped the *Jembe*, a small flat iron hoe with handle, with which they till the ground, and hastened to the banks to see the steamer—a wonderful phenomenon in their eyes. The villages which I passed on the way up (wishing to get on as fast as possible for fear of the water falling) I called at on the way down, and made friends with all.

At the village of Gelib I saw cotton growing, which was picked by girls, and twisted on to improvised reels. A man was spinning with a wooden loom and shuttle, very primitive but ingenious in design, of native make. The man sat in a hole, working a double treadle, and wove cloths of excellent texture, which were worn by the natives. On inquiry I learnt that no one from the village had ever been to the coast or seen a white man.

After leaving Bilo, which is just 100 miles from the mouth, we found dense, impenetrable forest on either side. Presently we arrived at a point where the Juba, in its downward course, forks and sends off a branch on the right bank to the south-west. I believe this may be the origin of the Sheri, which, as is well known, flows southward and empties itself into the ocean at Port Durnford, 80 miles down the coast, midway between Kismayu and Lamu. Mooring the *Kenia* alongside the bank, I explored this branch in a small boat for 20 miles downwards. It was from 3 to 3½ fathoms deep, with a current of 3½ knots, and was enclosed by dense forest on either side. The stream was so narrow that the branches of trees in some places projected almost across; it was, in consequence, quite unnavigable for the *Kenia*.

From the depth of the water and the large volume coming from the main river, I concluded that it flows for some distance, and this opinion was confirmed by the natives, for they said it went to the "big water" (the ocean). I shot two very large crocodiles, 14 and 16 feet in length respectively; one must have been very old, to judge from the depth of scale.

In a small Waboni village I stopped at, the people lived almost entirely by fishing. Fish were plentiful in the river: they were of several kinds. One was as large as a salmon, but with an enormous head and teeth. Numbers of large turtles, from 30 to 40 lbs. in weight, were also caught in the Juba with a strong hook and line. On several occasions I had turtle-soup and wild duck for dinner when in the river.

On leaving the Sheri, the *Kenia* proceeded between wooded banks to the village of Mfudo. This is one of the last stations of runaway slaves. The work of clearing the forest was still in progress, and *Shambas* had not yet been laid out. The forest extends for about one mile further, and is then succeeded by thick thorn-bush for another three-quarters of a mile, after which you emerge on to vast undulating grass plains, so common in African scenery. I had some excellent shooting at Mfudo, the headman, Shongolo, being a capital hunter. I landed several times on the opposite bank, and followed a small game track through the forest until I came out on to the plain.

I saw several herds of magnificent ostriches, but, as there was no cover, I never could get within 500 yards of them, even after crawling for hours in the hot sun, for their scent or sight was so keen; suddenly they would look round and dart away, and not stop for several miles. Vast herds of buck, *Topè*, *Kuguni*, *Wildebeest*, and smaller kinds of antelope roamed over the plain, and furnished several large bags; one rhinoceros was shot.

On July 29 we came to the last settlement of the Goosha district, called Shionde. The inhabitants were only about 30 in all, and they had lately arrived from one of the larger villages to establish a settlement and clear the forest for cultivation.

Again we entered dense primeval forest. The scenery was beautiful. Between thick green masses of foliage, standing out against the blue sky, ran the brown, muddy river, amidst silence unbroken except by the stroke of the stern-wheel or the occasional splash of a crocodile disappearing off the bank into the water on the approach of the vessel.

The most common kinds of trees are acacias, African oak, tamarinds, and several varieties of green thorn-trees, etc. I was struck by the large masses of purple convolvulus which, intermixed with the thick network of creepers which covers most of the trees, helped to form a serried mass of foliage. Through a small creek running off from the left bank I made my way by canoe into a large lake having no other outlet. Large flocks of pelicans, herons, storks, and other waterfowl thronged the banks, never moving on the approach of the canoe; probably no other human being had even been into this lake before.

In the black alluvium of the river I saw several sparkling grains of metal like gold-dust. I washed some samples, and, the grains of metal still appearing, I put some in a bottle for transmission to Mombasa, but have not yet heard what it is. It is very likely to be talc, which shines like gold, and is found in many places in Africa.

For several days the dense forest continued without intermission. Numbers of hippo were about, and I secured several.

Thick fogs in the mornings hung over the river until eight o'clock, when the heat of the sun dispelled them. The average heat was 90° in the shade during the day, and 83° at night. The monsoon at times blew very strongly, making the nights much colder, but the temperature during the day never varied. The average depth of the river thus far up was from $1\frac{1}{2}$ to 3 fathoms.

On August 2nd, after five days' steaming through forest land without seeing any sign of human life, we suddenly emerged into the open, and arrived at the village of Kabobe. It is inhabited by a very mixed race, consisting of Somalis, Gallas, Swahilis, Kabyles, and Waboni. The chief, Taiu, after a little time became very friendly, and the vessel created the greatest excitement, hundreds of natives of both sexes standing or sitting on the bank alongside day and night, gazing at it with the greatest astonishment.

There were numerous *Shambas*, and the people here lived partly on the produce of the land and partly by hunting. Sweet potatoes, bananas, *Mahogo*, *Koondi*, and *Cherokee* (a small green bean) were obtainable in abundance, empty glass bottles being eagerly accepted in exchange. I had two days' shooting on the left bank, and obtained several water-buck.

In one night the river rose 18 inches. From all the information I collected on this point at several different places, it would appear that during the months of August and September the water rises suddenly, and in a week or ten days falls again with the same rapidity, this change of level occurring several times during these months. Twice this sudden rise and fall came under my own observation. The natives told me it was caused by the rains far up the country bringing freshets down; but comparatively no rain fell over the expanse of country through which I passed. The chief here told me that the river is in flood during part of July, August, September, and October; it falls rapidly in November, when it is possible to walk across its bed. In December and January the water is very low; in February it rises, and is partially in flood during March and April, after which it falls again until July.

On August 4th we left Kabobe, passing Saku, a large village on the

right bank close to Kabobe. The features of the river altered somewhat, the reaches being wide and shallow, with a depth of from ½ to 2 fathoms. Here the vessel grounded on sand-flats, but came off again.

Passing beneath a high bluff of slaty rock that rose precipitously from the water to a height of 30 feet, we soon after emerged from the woods into the open plain, studded with *Mkono* palms and mimosa. High, flat ranges of hills rose on the north-east. From Anoleh, in latitude 2° N., the banks entirely changed in character, becoming hard and stony, with slate intermixed. A plateau 200 feet in height extended on either side for some distance, with a peculiar sugar-loaf peak close to the right bank. The water was now very shallow, and the vessel grounded repeatedly. There were great numbers of hippopotami about, as many as fifteen or eighteen standing close together on a bank in the centre of the river. Just before arriving at the large Somali village, Munsoor, we passed three high, rocky bluffs, rising to 150 feet sheer from the river.

Here I was informed that the Sheik of Bardera had sent down to say that the European was to go back, and not attempt to go up to Bardera, or he would be killed. He added that the only European who, many years ago, had come to Bardera had been killed, and that the same fate would befall me. I replied that I was going to Bardera, and wished to make friends with the Sheik. (The up-country Somalis have nothing to do with the coast tribes and Ogaden.)

Turning a bend, we came in sight of Bardera on the evening of August 10th. The town is situated on a hill adjoining the river, on the left bank. The whole of the bank was lined with Somalis waving their spears, and evidently, from their excited state, some trouble was brewing. The crew in terror begged me to turn back. I made the vessel fast to the right bank opposite Bardera, the river here being sixty yards wide. I sent an interpreter, a Somali of the coast, to speak with the Sheik, but the men rushed down to the landing-place, brandishing their spears and threatening to kill him if he landed; so I hailed to him to return.

After I had established the porters in a camp alongside the vessel on the right bank, I received news through some of the Barra Somalis that the sheik was sending a large force across some little distance up to attack the vessel that night. I thereupon withdrew the men on board, leaving the tents pitched and the fires burning, and quietly pushed the vessel from the bank into mid-stream.

At 11 P.M. I saw large bodies of natives on the right bank, moving about between the trees. Suddenly they dashed into the river, swimming off on both sides. Unfortunately, or let us say fortunately, my Maxim guns were useless and could not be fired, owing entirely to circumstances beyond my control, and my crew were too frightened to use their rifles. When the Somalis were just clambering on board, I fired a sound signal which I had with me, hoping that it might from its novelty intimidate the savage nature.

These signals are fired from a socket fixed upright in a tube, and, having used them a great deal on the coast in England, the thought occurred to me, in Mombasa, how well they might answer as a last

resource with natives when used for the first time. I therefore carried several with me in my former expedition through the Masai territory, but never had occasion to use one. On the present occasion the signal proved most effective. When it burst in mid-air with a loud explosion, lighting up with a shower of red stars the water, which was black with heads, I had the satisfaction of seeing the natives all turn and make for the banks in terror. No further attack took place.

The next morning, knowing that some move was imperatively necessary, I landed suddenly amongst the Somalis at Bardera unarmed, with my interpreter, and pushed through the threatening crowd of natives to the Sheik, expecting half-a-dozen cold spears through my back every moment, as they pressed round with their spears raised.

I think the sheik was too astonished for words. I said *Aman* (peace), and told my interpreter to tell him that I meant to do him no harm, but wished to be friends. The chief at last asked me how I dared to come unarmed among them; that I was completely in his power, and that he could easily make an end of me. I said he might do so if he liked —that I cared nothing for him; but I knew I had done him no injury, and why should we not be friends after I had shown him the previous night what I could do, but without hurting any of his people? Had the Company wished to take his country I would have come with a large force, instead of quite alone. Was it to be *Aman* or not? After a few moments, apparently taken aback at what seemed my hardihood, he said there should be *Aman*—at least until he had consulted the chiefs. He bade me go on board and await the result.

As you may guess, I waited somewhat anxiously; but at the end of five hours the Sheik sent a present on board as a token that we were friends. He said that he did not like white men in general, but that he rather liked me personally. After some days we became great friends. I told him I wanted to go further up the river, to which he at first objected; but on my offering to take as many of his people on board as we could hold, or to leave some of my own, he eventually consented, and sent the second sheik, with two other chiefs, to accompany the *Kenia* up to the rapids, situated 25 miles above.

Bardera is an old town with remains of a wall running round it; the population is about 1200. The huts are large and clean, the interior being hung with skins and divided into two rooms. There is little or no cultivation around Bardera, and the people live principally on cattle and sheep, vast herds of which feed on the banks. The great caravan route from the Baran country crosses the river at Bardera; by this are brought ivory and hides, which find their way to Brava and the northern ports.

Logh, another large Somali town, is five days' journey from Bardera. The road passes into the Barra, and does not follow the river on account of the very hilly character of the district and its dense thorn-woods. The only other route into the Boran country crosses the river at Logh. The Ganane district is several days' march above Logh.

With the second sheik and two other chiefs on board, I left for the rapids, the water in the river falling rapidly, and passed the village of

Murdah, beyond which the river ran through a range of steep, rocky hills 300 to 400 feet high.

Arrived at the rapids, where the bed of the river was a mass of rocks, I made the *Kenia* fast on the right bank near a small sand-beach. Baron von der Decken's ill-fated vessel, the *Guelph*, which was wrecked here twenty-seven years before, almost to the day, was lying close-to on her starboard side, the funnel still standing upright, and two trees growing up alongside. I visited the *Guelph* several times, and found one side all gone and two rocks protruding through the bottom, which was silted up with sand and mud. The shell of the port side, with the beams and davits, remained, and the cylinders and boiler were still in position. A larger and smaller island in the centre of the river divide it into three channels. The one off the right bank takes a very sharp turn, and is a mass of rocks; the centre channel is dry; and the third, off the left bank, is the only possible one. But I consider it utterly impracticable for navigation, as the depth varies from six inches to three feet. The current sweeps among the numerous rocks at the rate of six knots. I attempted to haul a small boat through, but had to give it up, for she was nearly dashed in pieces. One of the Somali chiefs, a very intelligent man, told me that four hours' march above the rapids the river falls over a ledge of rock; therefore, if a vessel could be got beyond the rapids, through a great rise in the river, she would be stopped by these falls. I wished to have gone by land to see the falls; but the chief informed me that there was no road, and that it would take some time to cut through the thick thorn-bush on the banks. The latitude of the rapids is 2° 34′ 45″ N. The distance from the sea by the river is 407 miles to the rapids, and 387 miles to Bardera. In the whole of this distance the Juba receives no affluent.

Leaving the rapids on August 16th to return to Bardera, we several times grounded heavily on the shallow sand-flats, the river having fallen several inches, and parts in the centre where the vessel had passed on the way up being now dry. We took three days to get to Bardera, having several times to clear everything out of the vessel to get her off. Remaining only one day at the town for fear of being stopped by want of water, and leaving the Sheik and his people on the most friendly terms, I started to make the descent of the river. Day after day the *Kenia* ran ashore on sandbanks, and the work of clearing all the stores out of her and transporting them to the bank through the strong current in one small boat was very heavy and hazardous. However, I succeeded in getting her off, and, after running numerous risks from the strong current and very sharp bends at different points in the river, at length arrived, on September 20th, at Gobwen, near the mouth of the river, after two months' absence. Here I was told that news had been received on the coast a month previously that the *Kenia* was broken up and the European in command killed, the crew being made slaves by the Somalis. The fact that part of the light casing of the *Kenia* had been broken off in a collision with some trees, and had actually floated down the river 250 miles, when it was picked up and forwarded to the Company's superintendent at Kismayu, naturally caused some credence to be attached to the story prevalent on the coast.

The Somalis are a fine race, extremely proud, and would not on any account show the slightest astonishment at anything; no expression of wonder ever passed across their faces even when I showed them the engines, the Maxim guns, and a revolver. Their dress is a white cloth, 7 yards in length and $2\frac{1}{2}$ in width, of broad *Amerikani*, or drill, which is wound round the body, the end being thrown over the shoulder. The women of Bardera, in addition to the white cloth, have a *kanaki* cloth of dark blue or black over the head, and wear white leggings from the knee to the foot over sandals, which does not add to their personal appearance. The men are all armed with the long spear, small round rhino shield, and short stabbing-knife. Nearly the whole of the Somalis I met with are strict Mohammedans, and are most particular, especially in Bardera, in praying at sunrise and sunset. My position, on account of their strict Mohammedanism, was a somewhat perilous one, as I was looked upon as an infidel; and the Sheik said that for this reason it would be unsafe for me to go about, as it would take some time before his people could become habituated to seeing a European among them.

The grasping nature of the Somalis is very observable; no matter what was given in the shape of a present, they invariably wanted more. The second sheik and the two other chiefs whom I had on board for several days were most observant, and very anxious to know about everything, asking numberless questions. They eat a great deal of meat, but the favourite dish throughout Somali-land is coffee-beans stewed in *ghee*, a kind of rancid fat.

The climate is excellent; not a single case of fever occurred during my stay in the river. This I attribute to the dry heat, and to the fact that the river does not overflow its banks, and, like the Tana, create vast malarial swamps. In that river the clouds of mosquitos at night made life unbearable, but in the Juba it was an exception to find many of these insects, and most of the time a curtain could be dispensed with. One peculiar feature in both the rivers is that, almost at the same point, viz., 350 miles from the mouth in the former and 400 miles in the latter, a chain of hills, with rocks and rapids, commences, which would imply that in East Africa a rocky stratum, running north-east and south-west, crosses both rivers.

The country on the Juba is admirably adapted for cultivation and European enterprise, especially in the Goosha district, the ground being very fertile, and the people glad and willing to receive Europeans and trade with them.

I hope that, as the river has now been ascended without bloodshed, the way will be open for further communication, and that peaceful trade —the great object of a chartered company—may soon follow, and eventually in some measure recompense the world at large for the philanthropic efforts of the Directors of the Imperial East Africa Company.

MADAGASCAR.

By M. Joël le Savoureux, French Consul.

(*Read before the Society in Edinburgh, February* 1893.)

Before commencing this lecture, I desire to thank the Geographical Society for the honour they have conferred on me by the flattering invitation conveyed to me by General Sir R. M. Smith; but I must confess that I feel rather nervous at the idea of speaking from a platform which has been occupied by eminent and eloquent men of science far superior to myself.

However, I have two excuses for my boldness: first, that the country about which I propose to speak is little known by the general public; and second, that I lived there for nearly three years, so that I hope to succeed in interesting my audience by speaking of things not often mentioned, but which I know to be facts, having seen them with my own eyes, which, I believe, cannot always be said by lecturers.

Having said this, I will turn to my subject. You know the situation of Madagascar on the map: it is a large island on the south-east of Africa. I will not give many figures, which are tiresome in a lecture, and those who are interested in them can always obtain them from books. I will only say that the greatest length of this island from north-east to south-west is about 1000 miles, and its greatest breadth from east to west about 315 miles. To give a better idea of its extent—for figures do not convey much to those who are unaccustomed to geographical measurements—I will add that Madagascar is, after Borneo (and the insular continent of Australia), the largest island in the world, and I trust I may not wound British pride if I say that it has a larger area than Great Britain, or even than France. We have thus to speak of a country which, if only on account of its great size, is worthy of your attention.

What is the population? That is a vain question, for no one—rest assured—no one in the world can know it at the present moment, nor, perhaps, for many long years to come.

Later on in the course of this lecture you will understand why. Numerous travellers, both French and English, have given approximate figures, which vary between three and four millions. This estimate does not appear to me extravagant, and I think the truth lies between the two figures, though I am unable to speak with certainty. In any case, what a much larger population this great country could support!

Though we cannot correctly estimate the number of the Malagasy, we can still consider the importance of the island; I do not mean from the point of view of what it yields, which we will go into by-and-by, but from that of commercial intercourse and international politics.

There are two routes to India and the far East, one round the Cape of Good Hope, discovered by Vasco da Gama, and the other opened out by M. Ferdinand de Lesseps through the Suez Canal. The latter route

may be closed any day in consequence of European complications, but the former will always remain open, and is commanded by Madagascar.

I may remind you, by the way, without speaking of our historical rights, and of our protectorate over the whole island, recognised by England, Germany, and all the Powers interested, that France has, since 1885, possessed in Madagascar the Bay of Diego-Suarez, and the territory surrounding it, in full proprietary right. Many long years before that we occupied the little island of Sainte Marie, the islands of Nossi Be, Nossi Mitsio, Nossi Faly, Nossi Cumba, and not long ago we established ourselves in the Comoros. Finally, the island of Réunion (Bourbon), possessed by France for the last century, is only two days' steam off. The statesmen who direct the counsels of great colonising nations have never ceased to take an interest in this island, placed, as it is, at the bend of the great route leading to the far East.

But, before entering on what I may call the political history of Madagascar, I must revert to her geographical history.

The island, notwithstanding her large size, was not discovered until comparatively late, and then by mere chance, fourteen years after Christopher Columbus, landing on the 9th October 1492 at San Salvador, one of Lucayos, off the coast of America, revealed to Europe an unknown world. It was, in fact, on the 10th of August 1506 that some Portuguese vessels, commanded by Admiral Fernan Suarez, were, when returning from India, cast by a storm on to the Malagasy coast; but it was not till very much later that Europe realised the importance of the country thus accidentally discovered.

The name of the first Portuguese navigator who touched these shores has not been lost. It is associated with that of Diego Lopez de Sequeira, who was sent on a mission by King Emmanuel of Portugal. The French colony of Diego-Suarez is named after the two navigators.

It would be long and tedious to enumerate all the successive attempts made by different Powers to establish themselves in the island. However, it may not be without interest to mention, in passing, that this country was probably not unknown to ancient history. It is quite possible that the Phœnicians, in the course of their famous voyage of circumnavigation, may have seen Madagascar. A French author has tried to prove, to my mind paradoxically, that Madagascar was colonised by the Carthaginians. An English writer, whose name I forget, maintains, on the contrary, that the original Malagasy were Jews, but this hypothesis rests on no sound basis. What is more certain, because we have almost indisputable proof, is that the Arabs, and also, perhaps, the Chinese, frequented Madagascar from the seventh century B.C., and traded there long before the accidental discovery of Fernan Suarez.

Marco Polo, the celebrated Venetian traveller, in the fourteenth century, collected information about this island from the mouths of Chinese and Arabs, and, curiously enough, it was he who gave its name to Madagascar a century before it was discovered by Europeans.

From whence did this name come? In my opinion it forms a valuable guide to the origin of the colonists who lived on Tani Bé, the "great country," as its inhabitants call it.

And, first of all, did Madagascar ever form part of the African continent? Notwithstanding its proximity, I personally do not hesitate to answer "No." The population is not black, in spite of its having mixed for centuries with the slaves brought from the opposite coast of Mozambique. Their colour is chocolate or *café au lait*, sometimes lemon colour. They are not of the well-known Negro type—flat noses, thick lips, etc.: the preponderating tribe, that of the Hovas, has not even the crimped woolly hair of the other colonists, their hair being smooth and glossy. The flora is different from that of the opposite coast of Africa. The fauna is characteristic. In Madagascar one sees none of the animals, such as elephants, rhinoceros, hippopotamus, giraffes, ostriches, etc., nor any of the deer, lions, tigers, panthers, and jackals, nor even the venomous snakes, which are peculiar to the great black continent. Looking at it from this point of view it is a privileged country. But the island has the lemurs, which are peculiar to Australasia (Australia and the isles of the South and the Pacific), and also humped cattle, that remind one of the zebus of India and the Malay Peninsula. Many plants which are common to Madagascar and the south of Asia and Australia are not found in Africa. Finally, the native language has a very close resemblance to the Malay dialect. To quote only one example, but a characteristic one: in Malay as in Malagasy the *l* and the *d* are often interchangeable—*lakana*, a canoe, and *an dakana*, like or near a canoe. It is sometimes difficult to distinguish between the two letters by their sound, and this explains how it was that Marco Polo called the country Madagascar, while its name was pronounced *Malacassa* by the natives or foreigners from whom he gained his information. Note also that in English you say Malagasy, while we French say either Malgache or Madecasse.

This confusion between the *d* and the *l* adds further support to the hypothesis, in my opinion a true one, which brings the Malagasy from the peninsula of Malacca. How did they come so far from their native country? Some suppose that formerly a continent, since submerged, or at least a chain of islands, brought Madagascar into easy communication with the south of the Asiatic continent. Others think that the monsoon, a north-east wind which prevails from October to March, carried the Malay boats very easily to the shores of Madagascar. Even in our own times numbers of boats of very light tonnage leave the Persian Gulf and the North of India, and venture on this long voyage. When, in the month of April, the monsoon begins to blow in the opposite direction, they spread sail, and return to the shore whence they started.

To sum up, Madagascar, in my opinion, ought not to be considered as belonging to the African, but rather to the Asiatic continent. It is difficult to doubt any longer that the inhabitants are of Malay origin, mixed with Arab, Negro, and European blood. The Arab influence has introduced certain religious customs, such as circumcision, which has become universal in the island. The Arabs also, in their characteristic handwriting, have preserved for us numerous historical or legendary accounts of the north-west coast, and, curiously enough, also of the south-east coast. The introduction of Negro blood came from the com-

pulsory immigration of slaves from the coast of Mozambique. On the east coast particularly, the presence for centuries of the European element, and during the last fifty years of the French element at Nossi Bé and the neighbouring islands, and also at Sainte Marie, has modified the race in a very marked manner. But notwithstanding all this, the race is homogeneous, and the language throughout the island is the same, with differences analogous to those which exist in the United Kingdom between, for example, the English spoken in London and in Edinburgh. Considering the difficult nature of the internal communications, this is an almost certain proof of the common origin of the inhabitants.

In spite of this common origin, the population—except those which are subject to the Hovas, and occupy about one-third of the island—is in a disintegrated state. The tribes plunder each other, and carry off oxen and slaves. A state of perpetual warfare prevails, without any controlling force or authority to impose peace. The territories of some of these tribes have been visited by French and English missionaries, and also by a French explorer, M. Grandidier, who has published a voluminous and learned work on Madagascar.

The best and most recent map is the work of a Jesuit; but it scarcely comprises more than Imerina, the country of the Betsileos, and, I think, that of the Antsianakas. This is, however, at least at the present time, the most interesting part of Madagascar, because it is the part which is subject to the authority of the Hovas, a name which is well known to you.

Are the Hovas a people? yes; a nation? scarcely; a government? perhaps: but not as we understand a government. A very complete work on Madagascar by M. de Flacourt, which dates back 200 years, does not once mention the Hovas, who at the present time declare that "the kingdom of our queen has no limit but the sea." He gathers from narratives and legends of Malagasy, and even of Hovas, that this tribe, thrown, no one knows under what circumstances, on the coasts of Madagascar, were badly received by the natives. They were for a long time treated as pariahs, and driven back into the forests of the interior, where they long lived in a miserable way.

How have these despicable creatures, spoken of by the other tribes, even in the present day, as dogs or swine, succeeded in establishing their supremacy over a full third of the island? We shall see. But first let me say that it is not from the Hovas themselves that we must seek to obtain their history. They know nothing of it except what they have heard from Europeans. Like all the Malagasy they possessed neither writings, monuments, nor archives of any description. There was no sacerdotal caste, like the one in Egypt, for example, whose chief mission was to keep up the remembrance of the great facts of the national history, the days of glory and of trial, the memory of heroes, and religious traditions. Nothing of that description is to be found in Madagascar—not even amongst the most gifted of the tribes.

It seems as if everything had been imported into this island; first its inhabitants, then its fauna and flora, a great part at least of the latter coming from Southern Asia; the language is a Malayan dialect. The writings, grammar, history, books, in fact all that is intellectual

(little enough), scientific, literary, artistic, or industrial, is entirely due to strangers. The principal clothing of the people is of cotton from England or America; France sends them her favourite musical instrument, the accordion; weapons come from England or Germany; and it is Mauritius which provides the Malagasy with their beverage, cheap rum. Finally, their money is French, but divided in the English manner into coins of 2 shillings, 1 shilling, and 6 pence. We have thus to deal with a race that at present produces scarcely anything itself, and except cottages, made of the leaves and stalks of palms, *lambas* (stuffs), made of silk or cotton, and a little wicker-work industry, owes nearly everything to strangers.

I am obliged to pass over the attempts, more or less successful, made by the French to establish themselves permanently at Madagascar, and hasten on to the nineteenth century, from which the political history of the Malagasy in general, and of the Hovas in particular, who are undoubtedly the most interesting tribe, really dates. Let us briefly sum up. Shall I first speak to you at length of Andriampoimerina, who founded the Hova kingdom, at the end of the last century and the beginning of the present one? No; first, because we have only the vaguest data to go upon concerning his personality and his acts; and secondly, because the account would weary you. Let us speak rather of his successor, Radama I. (1810), who when conquering the country of the Betsimisarakas brought his people back to the seashore, to the very coast where their ancestors had probably landed. He also conquered territories in the south, east, and north-east. It must be said that in his conquest Radama was largely assisted by the advice, money, and arms of the English, supplied by the Governor of the Mauritius, Sir Robert Farquhar.

His wife, who succeeded him in 1818, did not possess the enlightened mind of her husband. She soon yielded to the influence of the conservative party and the fetish priests, who were represented by many favourites; nevertheless, it was in her reign that the first Protestant English mission was founded, in 1830.

Ranavalona I. has been named by some historians the "Female Caligula." This severe epithet has perhaps not unjustly been conferred on her, seeing that, according to a very moderate estimate, no less than forty thousand persons died during her reign of thirty-four years, for their religious and political faith only.

It is hard to realise the atrocious cruelties that were perpetrated during this horrible reign. In the beginning all relations of the deceased king who might have some right to the throne were massacred, as well as all their adherents, or such as were suspected of being such. The Europeans were all dismissed; and their commercial, industrial, or religious settlements, as well as their churches and schools, were destroyed. The native converts nearly all perished. Every individual suspected of sympathising with the foreigner was arrested and subjected to the terrible trial of the *tanguin*, resembling the judicial trials and ordeals of the middle ages. The *tanguin* is the stone of a fruit of the size of a small pear, which, when grated, is a strong poison.

The fetish priests used to prepare the drug—I say "used to,"

because for the last twenty years at least, this horrible custom has disappeared. The accused was denuded of all his clothes, and tied so tightly that he could not move a limb. The poison was then administered to him in the shape of three pills wrapped in the skin of a fowl. If the accused succumbed, it was because he was guilty, and nearly all his possessions then fell into the hands of the Queen, the remnant being given to the informer. The wife, children, and sometimes the nearest relations of the victim were sold as slaves. Sometimes it happened that the accused could not retain all the pills, under which circumstance his case was considered doubtful, and subjected to a new trial. If the accused could not retain any of the pills he was released. The victims who were poor nearly always succumbed, under such circumstances, to the trial. But the rich ones had a very fair chance of coming out of the test as white as snow, unless there was some good political reason for their disappearance. In fact, in consideration of a certain sum given to the sorcerers, these used to diminish the dose in such a way as to render it inoffensive, or they authorised the relations and friends of the accused to give him some lukewarm rice water in such quantities as to provoke nausea, which led to the desired result.

The son of Ranavalona I., who died in 1861, was a very intelligent young man. Radama II. had been under the influence of Europeans, and especially of Frenchmen. He at once threw open the gates of Madagascar wide, and perhaps too early, to Western intercourse. The old Hova party, nobles and priests, made him pay dearly for this imprudence, for, two years after his accession, this king of thirty-four was strangled in his palace with a scarf of white silk, such as is reserved for the use of princes and nobles only.

Before proceeding further I must now go back a little. From the reign of Ranavalona I., mother of Radama II., dates in Imerina a rule analogous to that which existed in France during the seventh and eighth centuries, and which I will call the reign of the *Maires du Palais*. The Hova clerical and reactionary oligarchy has succeeded from 1828 to the present day—except during the reign of Radama II.—in placing on the throne a princess more or less young, who has married directly, sometimes after divorce from his first wife, a great chief, who takes the title of Prime Minister and Commander-in-Chief of the troops, and who governs in the name of the Queen his wife, whose power is only nominal. This is then a dictatorship, maintained by the prestige of the Queen's name, and by the influence of some great and rich families. Consequently, at the death of Radama II., the Prime Minister, Rainivoninahitrinioni, who was accused of having provoked the crime, lost no time in marrying the widow of the king, who was reigning under the name of Rasoaherina ("Beautiful and Strong"). The brother of the Prime Minister having succeeded in dethroning him, and some say in getting rid of him entirely, occupied his place with regard to the Queen, and on her death married the princess who succeeded her, Ranavalona II. When this Queen died, he married the princess who succeeded her, in 1883. He was then sixty years old, his new wife being only twenty-two. This "husband of the Queens" is at this moment the Prime Minister Rainilaiarivony, and his wife, the Queen, is named Ranavalona III.

After all I have related, and in spite of what many European political writers say, you must think that the Hova people, at least as regards government, cannot progress as civilised nations do. I have already mentioned the regions under the direct control of the Hovas, but I must add that they have isolated posts in Menabe, also among the Antaïmoro and the Sakalava of the west and north. The frontier of Betsileo has never been crossed by a Hova, at least without losing his head. The scattered posts of which I have just spoken are absolutely insufficient, not only for the maintenance of public order and the prevention of brigandage and raids of tribe on tribe, but even for the exercise of a minimum of administrative action, and to secure such elementary justice as is suited to a savage people. Moreover, people are often attacked in their homes and slain in its defence, and their wives and children are reduced to slavery. It is pure anarchy, such as existed during the decay and invasion of the Roman Empire.

As to the degree of civilisation pervading the governing class of the Hovas, I should not like to insist too much upon this point, nor on the sincerity of their conversion to Christianity, whether under the Protestant or the Roman Catholic form: anyhow, the great mass of the people have remained faithful to the social and idolatrous traditions of the good old times of Ranavalona I. A woman will go to the temple or to mass in the morning, and in the afternoon will prepare the poison with which to kill her rival. She will pray to God for success in her crime. A man dies, having been a Christian from his birth. After the funeral rites at the temple or the church, his friends and relatives will carry away the body to bury it in the land of his ancestors, with all the Pagan rites. That is to say, the corpse, wrapped in valuable *lambas*, will be placed in a cottage; the women will undo the numerous little plaits of their hair, and will chant litanies to keep away the evil spirits which are trying to seize upon the soul of the deceased, or will sing praises of his good qualities with a great deal of exaggeration. According to the rank or fortune of the deceased, a larger or smaller number of bulls is sacrificed in his honour, and the feast—for it is a real feast—will last five, eight, or fifteen days. The invited guests, friends and relations of the deceased, live at the expense of his heirs. Rice, beef, and rum are bountifully distributed. With a thermometer standing at from 35° to 40° centigrade, (95° to 104° Fahrenheit) you can imagine the noisome odours which are evolved after some days of this sort of thing. At Antananarivo the kings and princes are interred with great state, and in their stone coffins a considerable sum of money is placed. Tens of thousands of pounds sterling are buried with the bodies of Radama I. and of Ranavalona I. Beyond the capital, and more particularly in the country of the Betsimisarakas, with which I am most familiar, the tomb consists of the trunk of a tree hollowed out and split into two, the upper part serving as a lid. These funeral boxes are piled one on another without being closed. The poorest class of people are, however, content to bury their dead under a few inches of earth in woods, which are declared sacred, but from which putrid emanations freely proceed.

You will naturally say, "These are the manners of a primitive people."

It is just the same with the relations between the sexes, which, I will say in a few words, are very lax. Five francs given to the Government for a marriage or for a divorce is all that is necessary. Among certain tribes young people who wish to marry live for a short time under the same roof. If they are not satisfied with each other after this trial, they recommence life elsewhere. I pass lightly over this subject.

The money paid to the governors or officers of the Queen for marriages and divorces is only a small part of their income; and here I touch feelingly the blot in the Hovan Government, if indeed it can be called a government. The Hovan official is not paid at all. He must live on the country. He must extract from those he governs, God only knows by what means, the money and food necessary for himself and his subordinates. In order to live and present a creditable appearance, the Hovan officers—especially the high officials, who are very vain—are obliged to press the people and to use the *Fanampoana*, a terrible word which means "Queen's *Corvée*." All free men are subject to this *Corvée*. If a governor, or even the smallest official of a village, invokes the *Fanampoana*, it may be only for his private requirements, every one has to submit; he must either comply or pay what the chief requires. In virtue of the *Fanampoana*, the Prime Minister works thousands of Malagasy in the gold-mines, paying them only in rice; and I am not sure even of that. In virtue of the *Fanampoana*, the same Prime Minister employs in the cultivation of his own sugar plantations all slaves condemned by common law. One can imagine the abuses which men permit themselves to indulge in when they combine in their own persons military, civil, and judicial powers, are not paid for their services, and have the control of the *Fanampoana*.

Not to rebel and rise against this cruel tyranny, the great mass of the population must be of a submissive, gentle, and patient disposition.

In truth, the Malagasy, taken generally, is amiable and benevolent to strangers (*Vazaha*), whom he considers to be superior beings; he is ready to accept the rule of the strongest. He has good qualities—for example, family pride, honesty in commercial transactions, a desire for justice, and a certain feeling of social obligations—all qualities which unfortunately have not always been developed or encouraged by the European colonists. On the contrary, they—French as well as English and others—have taught the natives their faults and their crimes, rather than their talents and virtues; perhaps because they did not possess any of the latter.

Great progress has, however, been made in the well-known part of Madagascar during the last twenty years, and it would be unjust not to give the credit of this to the English and French missions. Unfortunately, when one says Protestant in Madagascar, this generally means English, while Catholic means French; but this is not always the case, and missionary work has not been the less successful on both sides. The village in which a mission has been established presents, as I have myself seen, quite a different appearance from others. The principal street is cleaner, the people behave in a more seemly way, and the religious service is edifying.

The activity of the English missionaries has been singularly fruitful; and if they would only abstain from politics, they might become powerful agents in the way of civilisation. The London Missionary Society (Independent) was the first to come to Madagascar, and is still the strongest. After it came the Society for the Propagation of the Gospel (Episcopal); then came the Quakers, who, I think, have amalgamated with the London Missionary Society. Lastly, the Norwegian Lutherans have a mission there.

The English missions have succeeded in making Protestantism an established religion. That is to say, in the Hova country all the Government agents, from the Queen and the Prime Minister down to the smallest custom-house officer, are obliged to attend religious services. In some places, indeed, the people are forcibly compelled to present themselves at church.

A few of the most recent figures will give an idea of the effect produced during the last seventy-three years by the Protestant propaganda on a population which numbers nearly 800,000 souls. There are 1325 parishes, with 277,114 members; 1175 schools, with 82,656 scholars of both sexes, and 5926 native preachers, most of them formerly officials.

At Antananarivo the English missions have established and are carrying on a theological institution, a kind of university, where the high dignitaries of the State Church and all the high officials are trained; a normal school designed to train teachers; another called the "Palace School," for the education of the sons of the nobility; a high school for girls; and many other less important establishments, besides a dozen churches.

Side by side with these English missions there is a Norwegian mission which is working on parallel lines.

The first English Protestant missions were established seventy-three years ago. The first French Catholic mission was not established till 1861, and has therefore been in existence only thirty-two years. It has, however, obtained considerable success. Here are the figures:—400 parishes, 115,000 members; 600 schools, with 20,000 pupils. From these figures it appears that Protestant influence in Madagascar is from the religious point of view greater than Catholic. I believe that the two religions can exercise a beneficial effect on the Malagasy people, and may gradually prepare them to receive what are commonly called the benefits of civilisation. The people are not opposed to this.

Unfortunately, the coast where the tribes live who are most disposed to submit to the influence of foreigners—I refer to the east coast—is unhealthy. It has been said of Tamatave, the principal port, and not without reason, that it is the cemetery of Europeans. If you go to Antananarivo, the capital, you will no longer be exposed to the constant danger of marsh-fever. It is true that the journey is a very expensive one. The bearers—for walking or riding must not be dreamt of—are paid 12s. or 15s. each. If you wish to travel without great inconvenience you will require twenty; it is a journey of seven or eight days, in sun or rain, at the rate of eight hours a day. And why all this difficulty to reach the capital? Because the Hova Government refuses

to permit the opening of a direct road from the principal port to Antananarivo. Radama I. said, "I have two invincible generals, *Hazo* and *Fazo*" (Forest and Fever). The tradition remains; the Hovas still believe that the forest and fever will prevent Europeans from reaching Antananarivo, and that is why they leave their roads blocked by swamps and virgin forests.

And yet, if the Government of Imerina would only half open the gates of this country, what riches would flow through to benefit both it and foreigners? Its wealth is beyond calculation. For in Madagascar you can plant sugar-cane, cocoa, vanilla, coffee, rhea; and all these will grow luxuriantly in a virgin soil, in a deep mould, provided that the owners can be guaranteed against the loss of their harvest by war or revolution—provided they can be assured of even the indigenous products of the Malagasy soil, some of which are obtained without any cultivation, such as india-rubber, raphia, copal gum, and others by very cheap labour, such as wood, skins, gold, iron, and copper, to say nothing of rice and the numerous useful vegetables of the tropics. I must not forget to mention the innumerable flocks and herds of cattle which form a most important article of commerce with the Mauritius and Réunion, these two islands having no animal food except the humped bull of Madagascar.

This country, it must be said, has remained closed up to the present time through the fault of the Hovas, who, jealous of their independence, and, in my opinion, ill-advised by Europeans, imagine that they can trade—for they are most keen traders—with the *Vazaha*, the white men, without giving them anything in exchange for their goods.

However, especially with the Hovas, there is first a political and social organisation, and then a very keen desire to assimilate the learning which Europeans can afford them. In fact, if I may judge from some Hovas I have seen and known very well, who had been instructed in English or French manners and customs, some of them think that if they can acquire a certain number of ideas, manners, and words, they may pass for civilised people. We must not look deeper than this.

Yet, with time and the teaching which they receive from all sides, it is not impossible that the Hovas, under the direction of France, may eventually assume in Madagascar the *rôle* of Piedmont in Italy, and succeed in accomplishing the unity of the island.

In the course of this lecture I have had occasion to speak of fetishism as the religion of the Malagasy. It is indeed their religion, if fetishism deserves the name. In the course of a journey across the country, you may meet with raised stones similar to our Breton cromlechs. On the rough parts of the stone are hooked rags of linen cloth or other similar objects. Further on you will be shown sacred woods, isolated trees, or fountains. The sacred woods are specially interesting, because they are the homes of monkeys, snakes, and very large spiders, who know that they will never be disturbed by the hand of man.

I remember an old fetish mango-tree, among the roots of which devotees used to slip some pieces of silver—a five-franc piece being cut into fragments—in order to appease the evil spirits.

Some robbers took the place of the spirits, and since then the tree, though still held in great reverence, receives only valueless offerings, such as the feet and comb of a cock which has been eaten by the devotees, or cups made of radish leaves, which have been filled with rum by the faithful—also emptied by them.

Here is another form of fetishism. A Malagasy slave, pursued by his master, hides himself behind a bush. Those who are seeking him notice that a partridge is quietly roosting in that bush. "He is not there," they say, "for were he, certainly the partridge would have flown away." And they pass on to another. The grateful Malagasy takes the partridge for his fetish. Never in all his life will he kill or eat one, and his family will observe the same rule. This is one example. But fetishism does not apply only to people or animals: it also includes inanimate objects, such as a tree or a stone.

I have just been speaking of a slave, which leads me to the great and painful question of slavery in Madagascar, or at least in the part of the country which we know. Without doubt slavery is a disgrace to humanity, and it is as degrading for the master as it is for the slave. It is to be hoped that slavery will disappear from Madagascar, as it has done from every country where European civilisation has really penetrated. But allow me to repeat the words of a Hova marshal of the fifteenth degree, in answer to the refusal of a Resident of France to give up one of his slaves who had sought refuge with a Frenchman. "If in France," said this Hova, who had received an excellent education in one of the English schools, "if in France some one stole a cloak of yours, you would consider him a thief; and if you saw your cloak on the back of some other individual, you would claim it through the police; in the same way I claim my slave, who is my own property." It is unnecessary to repeat to you all the reasons the Resident of France brought forward—he, however, did not give up the slave—to convince this high official, who was one of the very best productions of Western education in Madagascar. But I just mention this fact to show what difficulties are encountered by civilisers, whether missionaries or officials.

This question of slavery deserves a few minutes' attention. I will not wait to enlarge upon the difference between State slaves and the slaves of private individuals. The former are a privileged class, can attain to the highest honours, and therefore have no reason to envy the free man. But the others! They are in truth life-long servants, without wages, unconscious of their degradation, and scarcely giving to their master—when they do even this—more than a tenth part of their time. Many slaves prefer their position to that of the free man, because, were they free, they would be compelled to enter the military service without pay, for an indefinite time, and, should they acquire any possessions, these would be at the mercy of the officials of the Queen.

I knew the history of a slave, who himself possessed slaves and enriched himself by trade. His master offered to set him at liberty if he would lend him £1000 sterling. The slave refused his liberty, though he lent the sum, preferring rather to run the risk of its loss than to become a free man, and to incur the duties, responsibilities, and expenses incumbent on him as such. Is not this example a common one?

It is true that a slave may be ill-treated—often cruelly—and even sold by his master. But let us look at the other side of the picture. The masters have much trouble—I do not pity them, as they do not pay their servants—to secure the services of their slaves, however numerous they may be. I have known a great Malagasy lady, who nominally possessed 400 slaves, but could scarcely find four to carry her—she was impotent—or to serve her.

It is a sad fact that nearly half the population of Madagascar, as far as we know it, are slaves—prisoners of war, insolvent debtors, victims of an intrigue or of political vengeance condemned as criminals; and, finally, the sons of slaves, born in slavery, may be depended upon to recruit the ranks. The importation of slaves from Mozambique has been prohibited for the last fifteen years.

It must be admitted that this is a deplorable state of affairs, even though the condition of slaves in Madagascar is comparatively easy. But slavery is a social institution terribly difficult to exterminate. I call to witness one of your own countrymen, Admiral Sir Gore Jones, who, after having visited Madagascar, declared in his report, published in 1883, that the universal liberation of slaves would mean the ruin of the country.

However this may be, the slaves, who are obliged at least once a year to present themselves before their masters, are content to serve the *Vazaha* or white race for a comparatively small wage. On the day of the *Fandroana* or Fête of the Bath they give a piastre (4s.) to their master. This is on the 22nd November, the Malagasy New Year's Day, when all high officials, in full-dress uniform, wait in a hall of the palace for one or two hours in front of a curtain behind which they are assured that Her Majesty is taking a bath. All at once the curtain is raised, and the Queen appears, clothed in her most beautiful garments, and sprinkles her attendants with water proceeding from the same sacred source whence she ought, according to tradition, to take the water for her own bath. These New Year ceremonies are so long and so complicated that I can not undertake to relate them. Some of them are horrible to think of; for instance, the one which consists in eating beef killed ten days previously. Faugh! It is usual on these occasions to distribute gifts in the form of pieces of meat. The day following the Fandroana, at Tamatave, I was certain to discover a live bull in my garden, and to find under my verandah presents of joints of meat which would have been the envy of even an Edinburgh butcher.

During these *fêtes* of Fandroana, blood—of course I mean the blood of bulls—flows in streams down the lanes of Tamatave, and it is just the same with the rum of Mauritius, in spite of the official prohibition of the Hova Government. Besides this, all affairs of State, both political and administrative, are on the occasion of these revels set aside for at least three weeks. But it would be most unfair to judge the Malagasy people, or even the Hovas, from these horrible scenes.

One ought to see them in their daily life, enjoying their present existence, without care or thought for the morrow, trying to do the minimum of work necessary to gain their bare pittance of rice, but quite

incapable of resisting gluttony, intoxication, or even other passions, when they have a few coins (a five-franc French coin cut up into pieces) in the corner of their *lamba*. If not pressed by hunger or thirst, the Malagasy of the coast—I am not alluding to the Hova, who is eager for gain, and generally understands very well what he is about, but the Betsimisaraka —will spend the whole day stretched on mats in a cottage, or even outside on the ground, lying like a lizard, exposed to the fierce sun, sleeping, dreaming, chatting, or listening to the song of one of his companions. The Malagasy have usually a wonderful ear for music, and I have often heard my bearers humming very correctly an air that they had learnt from hearing it once played on the piano.

Oh, the beautiful nights in the Tropics! In every cottage a fire is burning, the smoke of which keeps off the mosquitos; laughter is heard on all sides; sometimes a musician brings out the sweet notes of an accordion; sometimes a voice is heard singing to the accompaniment of the *valiha*, a kind of harp made of bamboo fibre and producing a muffled sound. Or again, after the rice, squatting on the ground in the midst of an audience, a story-teller commences, with the fluency and volubility which are characteristic of the Malagasy, some story of this description, which, of course, I abridge:—

"The crocodile, king of animals, had tasted of every species of his subjects—fish, flesh, and fowl. Only one kind had escaped his voracious appetite; he had never eaten a guinea-fowl. The guinea-fowl is very suspicious, and up till now had refused to appear at his court. What could he do to induce it to come within his grasp? The courtiers of the crocodile suggested a stratagem. The king of animals should feign death, and his court should invite the queen of guinea-fowls, with all the chiefs of her tribe, to be present at the funeral obsequies. In the course of all the ceremonies and *fêtes* which were a necessary part of the mourning his Majesty would easily find an opportunity of seizing one of these birds as it passed. They carried out these designs. The guinea-fowls could scarcely be so uncivil as to refuse the invitation, so they came on the day they were invited, but remained at a respectful distance. On a bank of sand the king crocodile was lying motionless with closed eyes, surrounded by all his courtiers, who assumed a sad and dejected appearance. The queen of the guinea-fowls, addressing the apparent corpse from the distance, called out, 'O king of animals, are you really dead?' The crocodile never stirred. A second time the guinea-fowl asked the same question. Still no movement. Then said the guinea-fowl, 'If you are really dead, just prove it by opening your eyes.' The innocent crocodile raised his eyelids, and away flew the guinea-fowls, enjoying their laugh at his expense." And the audience laugh also, ceaselessly discussing this story, which, when told by a Malagasy, lasts at least two hours by the clock.

The love of singing is specially remarkable amongst the bearers of the *filanzana* and also among the boatmen. To give some idea of these songs, which for many long hours form an accompaniment to the rhythmic movement of the paddles, I will choose one of the least vulgar. The river flows gently; the crocodiles sleep in the mud, diffusing a strong

scent of musk; the bamboos bend their graceful arches over the water, joined by creepers with many-coloured flowers; on the surrounding hills the Travellers' tree spreads its gigantic fans; the heat is oppressive and the way long. Suddenly a rower, improvised leader, intones a rhythmic song of this description, which forms an accompaniment to the paddles:

"Rafaravelo climbed a tree, the wind blew, and the branch broke;
But there was something stronger than the wind,
It was the wall which arrested the fall;
Something stronger than the wall, the rat which gnawed it;
Something stronger than the rat, the cat which ate it;
Something stronger than the cat, the cord which hung it:
Something stronger than the cord, the knife which cut it;
Something stronger than the knife, the fire which melted it;
Something stronger than the fire, the water which extinguished it;
Something stronger than the water, the boat which cleaved it;
Something stronger than the boat, the rocks which shattered it;
Something stronger than the rocks, the crab which destroyed them;
Something stronger than the crab, the man who caught it;
Something stronger than the man: God."

The subject may be developed without end, according to the imagination of the leader. The melody is sweet, and the paddles follow the rhythm. You see that the song contains neither elevated poetry, nor profound philosophy, nor any high-minded sentiments, and yet I have chosen quite the best of its kind. I have already spoken to you about the natural religion of the Malagasy, which is idolatrous; but I should like to revert to it, because you might think, after all I have already said, that they have no spiritual ideas; and this would be false. They believe in a God—very vaguely, it is true, and their ideas are obscured by the conviction that this God employs for the most part maleficent agents. God's name is on their lips at every moment—never to ask for spiritual blessings, but to obtain a good harvest, to ask for children (the great desire and pride of every Malagasy), to escape a danger, or to be cured of an illness. The Malagasy offers to the Supreme Divinity the first of all his goods—rice, rum, or clothing. "To thee, Andriamanitra, our first fruits," or according to the dialect, "Andrianahary," names of which the most learned students of Malagasy have never been able to give me the exact meaning, but which designate a Supreme Being and a Creator with attributes the translation of which is uncertain.

The Malagasy in general believe, if not in the immortality of the soul, at least in its survival, but without any very clear idea as to rewards or punishments. Moreover, they believe that the soul can be separated from the body during twelve or fifteen months before death. When the person stricken with illness imagines that this misfortune has come to him, and that he has lost his soul, as Peter Schlemyl in the German story lost his shadow, he calls the *Sikidy* or sorcerer. When I compare the soul to a shadow, I am only repeating the belief of the Malagasy. For them, at least among most of the tribes, the soul is the almost imperceptible shade between the actual shadow and the

penumbra; so that when a sorcerer wishes to injure any one, he has only to pass close to his enemy, and, without appearing to have any design, to place his foot on the shadow, and behold, the soul is captured! How can it be regained? For a sufficiently high remuneration the *Sikidy* will undertake this. There are two ways: according to the first, the soul resembles a bee, which has flown away towards a neighbouring mountain, and it is caught again in a basket containing a cake of honey. The second way is this:—In a corner of the cottage belonging to the ancestors some cooked rice attracts the hungry soul. All the outlets of the cottage are carefully closed. The *Sikidy* holds in his right hand a hollow gourd, in the other a leaf of ravenala. He whistles gently. The soul approaches; the hum of her wings is perceptible only to the keen ears of the sorcerer. He pursues her as a butterfly-chaser pursues his prey. She escapes him; he continues to pursue the soul into every corner, whistling always, with constantly quickening movements. At last the soul, exhausted with the fatigue of this hot pursuit, allows herself to be driven into a corner of the cottage, and in hopeless despair takes refuge at last in the gourd. What triumph! The *Sikidy*, having carefully closed up the gourd, returns, followed by his family, to the invalid. His clothes are raised, and under them the *Sikidy* gently introduces his gourd, and opens it; the fugitive soul is then compelled to re-enter his former domicile. The *Sikidy* receives his present and departs. If the invalid dies afterwards, this is evidently his own fault.

Would you care for another story? A young man becomes insensible. His soul goes away to the south, to a mountain frequented by souls, and finds itself surrounded by a crowd of souls, who press round it for news. The poor soul, exhausted, as it has had nothing to eat except a shadow of rice, succeeds in making its escape, and returns to its own country just at the moment when the body to which it belongs is about to be buried, and hastens to re-enter it, to the great joy of the whole family.

But now you have had enough. I could have spoken to you on many other interesting questions—on legislation, on the Hova army, on dress; I could have suggested different ways of turning the natural riches of the country to profit; I could have given more curious details of Malagasy customs and ceremonies, both public and private; I could have described the landscapes, etc.; but this lecture has already exceeded the usual limits, and I hasten to conclude. Madagascar is a country with a future. Not only will the dominating tribe of the Hovas be called on sooner or later to impose order and unity on the other tribes of the island, but also—thanks to the protecting influence of France—Europeans will find there an ample market for their produce, and an extensive field for their commercial, agricultural, and industrial enterprises. I should like to see all those who now listen to me at Tamatave, or at Antananarivo, twenty-five years hence. Will you come?

THE CLIMATE OF THE INTERIOR OF GREENLAND.

By Professor H. Mohn, of Christiania.

I have already discussed the results of the meteorological observations, taken during Dr. Nansen's journey across Greenland in 1888, in a memoir published as *Ergänzungsheft*, No. 105, to *Petermanns Mitteilungen*,[1] and recently I have acquired a knowledge of the results obtained on Lieut. Peary's journey over the inland ice of Northern Greenland from the newspapers and the lectures delivered in Christiania by his companion, Mr. Astrup, a Norwegian. From these data it is possible to construct, in general outline, a sketch of the climatic conditions of the interior, which I shall now proceed to delineate.

Greenland is an elevated land covered with eternal snow and ice; only a narrow strip along the coast is free from snow in summer. The highlands of the interior have the form of a shield, sloping steeply to the coasts, but, further inland, inclining gently up towards the centre. On the 64th parallel, the culminating line lies somewhat nearer to the east coast than the west. Both in the lower and higher latitudes, considerable altitudes are attained. Nansen's highest point was at 8800 feet above sea-level, and Mr. Peary found, near the 80th parallel, elevations of about 8000 feet.

In respect to atmospheric pressure, the interior constitutes an almost permanent anticyclonic region. Areas of minimum pressure that pass steadily over the adjacent seas may sometimes extend their limits over the inland ice, but a belt of high pressure is generally left between the cyclones of Baffin's Bay on the one side, and those in the Greenland Sea on the other. It is rare that a centre of minimum pressure passes across Greenland from west to east, as in the case observed by Dr. Nansen, on September 7th, 1888, when a strong wind from the south-east was followed, after a short lull, by an equally strong wind from the north-west.

The variations of pressure are less in the interior of Greenland than on the west coast or in Iceland.

In complete accordance with the existence of high pressure in the interior is the observed fact, that the winds over the inland ice blow, as a rule, towards the coasts. During Dr. Nansen's journey, 45 per cent. of the winds on the eastern side blew from the north-west, while on the western side 29 per cent. came from the east, and 21 per cent. from the south-east, the least frequent winds being the north-east on the one side and the west on the other. On Mr. Peary's route, the prevailing wind was from the south.

The observations of Dr. Nansen, and of the Danish meteorological stations on the east coast, show that on the 64th parallel the mean annual temperature at an elevation of 6560 feet is about −13° F., or, reduced to sea-level, 5° F. Assuming the mean annual range to be the same as in Lapland, which is certainly not too high an estimate, we arrive at a mean temperature for the warmest month, July, of 14° F., or 32° at

[1] *Wissenschaftliche Ergebnisse von Dr. F. Nansen's Durchquerung von Grönland*, 1888. Von Professor H. Mohn und Dr. F. Nansen. Gotha: Justus Perthes, 1892. 1. Theil: *Ergebnisse der astronomischen, magnetischen, trigonometrischen und meteorologischen Beobachtungen*, von H. Mohn.

sea-level. For the coldest month (January?), the mean, found in the same manner, will be $-40°$ F., or $-22°$ reduced to sea-level.

From these figures it is evident that it is incorrect to draw the isotherms, as has hitherto been done, due east to west across Greenland. They should be drawn in curves following the outline of the coast, a method fully justified by the more recent observations in other continental countries. If we examine a good set of isothermal charts—those, for instance, of Dr. Julius Hann [1] or Dr. Buchan—we see that an isothermal line for the year of 5° F. must follow the curvature of the coast.

Within this lies the isotherm for 0° F., passing through the interior and the northern parts of Greenland. The isotherm for 14° F. runs from the 72° parallel on the west coast southwards along the sea-board, touching or crossing the long fiords, turns eastward round the south of Greenland, and, following the east coast past Scoresby Sound and over Franz Josef fiord, reaches the shore at about the 78th parallel, where it passes out to sea.

The isotherm of 32° F. through the central parts of Greenland is easily drawn on Hann's or Buchan's [1] chart (for July). I have carried it up to the 80th parallel, determining its course from the following reasoning. The sun in summer is here circumpolar, but only about noon is it high and powerful enough to check the radiation from the ground, and the highest temperature it can produce is 32° F., its energy being chiefly spent in melting snow. During the night, on the other hand, the sun is so low that radiation from the snow is freely propagated through the rarefied air, and the temperature sinks considerably below the freezing-point. The mean temperature of the 24 hours will, therefore, be several degrees below 32°, and only just reach that point when reduced to sea-level.

Now, Mr. Peary observed in July, near the 80th parallel and at elevations of about 8000 feet, temperatures ranging during the day from $26\frac{1}{2}°$ to 32° F., and in the night from 23° to 5°, from which records we obtain a daily mean of about 21°, or, reduced to sea-level, 37° to 39°. Consequently the isotherm of 32° at sea-level seems not to reach quite as far north as I supposed, but the difference is immaterial.

In the coldest month we find in the interior on the parallel of 64° a mean temperature, reduced to sea-level, of $-22°$ F. The corresponding isotherm also runs parallel to the coast, beginning on the 76th parallel on the west, and reaching the 64th in the interior, whence it ascends to lat. 80° on the east coast. We are further warranted in drawing an isotherm for a temperature as low as $-40°$ F. in North Greenland, for the mean for January in the straits between Greenland and America is $-31°$.

In the month of September Dr. Nansen experienced during the night temperatures of $-49°$ F., and in the winter Mr. Peary recorded minima below $-58°$. On board the *Alert* Sir George Nares observed a temperature of $-74°$. We may, therefore, conclude that in winter the minima are as low as $-76°$ or even $-90°$. The interior of Greenland is, indeed, a pole of cold, situated in the opposite longitude to that of Siberia, with which it is well able to compete in extreme severity.

The daily range is very considerable in the interior during the

[1] *Atlas der Meteorologie* (in *Berghaus' Physikalischer Atlas*, Part III.), Tafel II., Nos. 27, 28, 29. "*Challenger*" *Report—Physics and Chemistry*, Vol. II., Part V.

solstices, owing to the great radiation that takes place from, or to, the earth through the highly rarefied atmosphere. In clear, cold weather it sometimes amounts to 40°. Such a range is elsewhere found only in deserts, but the interior of Greenland is really an elevated, snow-covered desert.

The low temperatures and large ranges observed refer only to the lower strata of air immediately above the snow, where the effect of radiation is most powerful. In the higher regions of the atmosphere the downward movement of the air in the centre of the anticyclonic area must render the air warm relatively to the height, and the climate will be less severe than on the snow-clad ground.

The relative humidity in the interior of Greenland is generally rather considerable, the mean being above 90 per cent. *Föhn* winds are not observed here: they are confined to the valleys on the edge of the inland ice, the fiords, and the coasts.

In the interior of Greenland Dr. Nansen found that the coldest wind was the north-east, and the warmest the south-west. On the eastern side the south-east was accompanied by the greatest amount of cloud, and the north-west by the least. On the western side the west and south-west were the cloud-bearing winds, the clearest sky occurring during north-east winds. When the wind blew from the sea there was the greatest probability of precipitation. Thus we see that those coming from the interior were dry winds. Snow fell about every fourth day, and every fourth day the sky was clear; every other day the sky was overcast. Fog was rare.

From the foregoing remarks it will be seen that the climate of Greenland is continental, with large ranges of temperature. The mean temperature for the year is low, and for the winter very low—perhaps the

Isotherms for January.

lowest to be found on the globe. In contrast to the climate of other continents the summer temperature is also low, owing to the high latitude, the great elevation, and the vast extent of continuous snow-fields. Both in summer and winter the interior of Greenland contains a pole of low temperature, a centre of high atmospheric pressure from which anticyclonic winds radiate.

Isotherms for July.

Isotherms for the year.

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

A Meeting of the Society was held on February 9th, in the Society's Hall, when Commander F. G. Dundas, R.N., read a paper on his navigation of the Juba river, illustrated by lime-light views. The Rev. Dr. James Stewart, of Lovedale, presided; and Mr. A. L. Bruce proposed a vote of thanks to the lecturer.

Commander Dundas repeated his lecture at a meeting of the Glasgow Branch, held on the following evening, when Mr. Timothy Bost presided, and votes of thanks were accorded to the lecturer and chairman, on the motion of Dr. Colville and Mr. R. A. Robertson.

On February 23rd Monsieur Joël le Savoureux delivered a lecture (in French) on "Madagascar," illustrated by lime-light views. General Sir Robert Murdoch Smith, K.C.M.G., presided, and a vote of thanks was accorded to the lecturer on the motion of Dr. John Murray.

Mr. J. Arthur Thomson concluded his interesting and instructive course of lectures on "The Geographical Distribution of Animals" on February 20th.

The following resolution was passed at a meeting of Council held on the 23rd December 1892:—

> "That ladies and gentlemen from the Colonies, and foreigners, who may visit Edinburgh, be invited to make use of the Society's rooms, on showing their cards to the Librarian, who will present them with tickets of admission to any of the ordinary meetings of the Society which they may desire to attend."

GEOGRAPHICAL NOTES.

By W. A. Taylor, M.A., F.R.S.E.,

Librarian, R.S.G.S.

EUROPE.

The Population of Rome.—On June 30th, 1892, the population of the capital of Italy reached the number of 438,123. Since Rome was made the capital of the kingdom its population has increased by over 200,000, the number given by the census of December 31st, 1870 being 226,022. Never since the time of the Roman Empire, when a census of Augustus, B.C. 28, gave a result of 1,336,680 inhabitants, has the present number been reached. The population sank to its lowest, 17,000, during the "Babylonian Exile," rose under Leo X., 1513, to 40,000, sank again to 33,000 during the war of 1527, and then gradually advanced till it reached 153,004 in 1800. During the troubled times of Napoleon the population decreased, but since then it has always been increasing. The third hundred thousand was reached in 1880, and the fourth in 1888.—*Mitt. der k. k. Geogr. Gesell. in Wien*, Bd. xxxv. Nos. 9 and 10.

The Temperature of the Baltic Lakes.—While the physical conditions of the water of the Alpine lakes, remarks Dr. W. Ule in *Petermann's Mitt.* Bd. xxxviii.

No. 12, have for many years been the subject of scientific investigation, hardly anything is at present known of the Baltic lakes. Even of their area and depths but little has been ascertained. The only reliable observations of temperature are those published by Dr. Seligo, in 1890, in the organ of the Naturforschende Gesellschaft zu Danzig. His surface temperatures are of little value, for they are in general based on single observations, and the time and air temperature are not given. It is, however, a fact worthy of remark, that in some cases the surface temperature near the shore differs considerably from that in the middle of the lake. This is particularly striking in the case of the Sianowo lake, a sheet of water 173 acres in area, with a depth of 56 feet, where, in May 1889, the thermometer marked 72·5° F. near the shore, and only 66·2° in open water. Again, in the Bölzig lake, which has an area of 660 acres and a depth of 85 feet, the surface temperature over a depth of 6½ feet was 62·6°, over a depth of 49 feet 53·6°, and over a depth of 69 feet only 51·8°. The latter example shows clearly that the higher temperature near shore is due to the more rapid heating of the shallower water; and it would be interesting to inquire over what depth the surface temperature reaches a constant value.

Of more scientific importance are the observations which Herr Seligo made at various depths. Dr. Ule exhibits in a table the temperatures of the Great and Little Skrzynka lakes and of the Mausch lake. The former, situated in the Berent District, are round, funnel-shaped basins, the larger having an area of 32 acres and a maximum depth of 88½ feet, and the other an area of 12 acres and a depth of 49 feet. The bottom of the large lake is formed of fine black mud. The Mausch lake is of a different character; its area is 1191 acres, and its greatest depth 121 feet. Being an old glacier lake, it exhibits many vagaries in outline and in the relief of the bottom. A narrow tongue of land cuts off a small portion, which is called on maps the Little Mausch lake. In the Great Skrzynka lake the distribution of temperature is very remarkable. At a depth of 50 feet a lower temperature is obtained than at the deepest point of the Mausch lake; the thermometer marked 41° F. when the surface temperature was 60·8°. Herr Seligo was himself astonished at the variation, and repeated his measurements, always with the same result. Whether the temperature conditions are due to the funnel shape of the basins or to the black colour of the bottom, cannot be decided from one experiment; but the fact that the shallower Little Skrzynka lake has likewise a low bottom temperature tells somewhat in favour of the former supposition.

If now we turn to the vertical distribution of temperature in the Mausch lake, we find that the fall is by no means proportional to the depth throughout. In the upper strata the decrease is very slight—only about ·05° per foot; then it suddenly rises, amounting in some instances to as much as 1·3° per foot. There is, therefore, evidently a depth at which a sudden change takes place—a *Sprungschicht*, as Professor Richter termed it in his report on the lake of Wörth to the ninth German Geographical Congress. In the Mausch lake this stratum would appear to lie rather deeper than in the lake of Wörth, where it was found, in the same month, August 1889, at a depth of 28 or 29 feet. Its position cannot be estimated exactly from the observations: it would appear to lie between 30 and 50 feet, and in some places even lower, the isothermal surface being curved, and probably sinking lowest over the deepest part of the lake. In the Little Mausch lake the *Sprungschicht* must lie at about 30 feet from the surface. The temperature of the lowest strata falls continuously, as in the lake of Wörth. The funnel-shaped basins of the Skrzynka lakes exhibit the same phenomenon, but in a less marked degree—another indication that the water in these lakes is warmed in some abnormal manner.

AFRICA.

The Rising of the Nile.—In certain respects, says *L'Afrique*, No. 1, 1893, the rising of the Nile last year was exceptional, and at the same time less destructive than was anticipated. Should the inundation be too slight, it does not bring to the cultivated lands the necessary quantity of fertilising mud and water; while, if it be too great, it often carries away the dykes, or causes infiltrations that destroy the cotton and sugar-canes. The late inundation was one of the highest, and, though it attained the limit of safety, no great disaster occurred. At one place in Upper Egypt the railway was washed away, and destructive infiltration took place at certain points in the delta. The nilometer on the island of Roda, opposite Cairo, marked about 50 feet, a height which has not been reached since 1887. Extraordinary measures had to be taken to guard against danger, and compulsory service was temporarily re-established by a decree of the Khedive. For the last ten years Egypt has been particularly favoured by the river, all the inundations except in 1888 being abundant.

Egypt: Disappearance of Desert Plants.—The Kew *Bulletin of Miscellaneous Information*, No. 72, contains a memorandum by Mr. E. A. Floyer, Inspector-General of Egyptian Telegraphs, on this subject. A main geographical feature of the country is a ridge some 2000 feet high, with peaks rising to 6000 feet above the level of the sea. Now, it might be expected that a different and richer vegetation would grow on the steep and comparatively moist slopes facing the Red Sea than on the western side. Finding that such is not the case, Mr. Floyer made an inquiry into the cause of the poverty of the flora. In the valleys of Northern Etbai a remarkable knowledge of botany is shown by the natives. As soon as a boy goes out with the flocks he begins to learn the names of the shrubs on which they feed, and, when he grows older and follows the camels, adds the names of another class to his vocabulary. With the botany is intimately connected the nomenclature of the geographical features. A mountain is generally called by the name of an adjacent valley, and the valley in turn is named after the principal tree which, at some time or other, grew in it. Now, it is very singular that in hardly one valley is the tree to be found from which it takes its name. Where the valleys run through soft sandstone stand at intervals huge boulders, under the shadow of which travellers have, from time immemorial, been wont to rest. Here are found scored on the rocks rude pictures of cows, horses, and lines of ostriches, all which animals have likewise disappeared from the country. As the names of these valleys, plants, and animals are Arabic, Mr. Floyer concludes that their disappearance must have taken place since the Arab invasion, and since that era there is no proof of any important change in the rainfall. Some other cause must then be sought for, and, moreover, one which would affect equally both sides of the range. This cause is, the author affirms, the camel, which was probably first domesticated in Egypt about A.D. 640. The Arab chops off the loftier boughs to feed his camels, and, as in that dry land few trees will bear the total removal of their foliage, this practice quickly leads to their destruction. Two sheep may be fed throughout the year on the leaves shaken down from an acacia, but the axe destroys this supply of provender in a few blows. Having made away with the acacias, the camel has to fall back on other shrubs, such as *Moringa aptera* and *Balanites*, so that it seems probable that before long the sheep and goat must follow the ostrich and cow, and the camel itself be confined to the valley of the Nile.

From Nyassa to Bangweolo.—On November 28th Mr. Joseph Thomson delivered an address to the Royal Geographical Society (*Geogr. Journal*, Feb.), in which

he described the journey he made in 1890 through Northern Zambesia. At the Cape Mr. Thomson met Mr. Grant, son of the late General James Grant, who readily accepted an invitation to join the expedition, and, later on, Mr. Charles Wilson was added to the party. On July 27th the *Domira* landed the travellers and their baggage at Kota-kota, a large village on the western shore of Lake Nyassa. Here Mr. Thomson made barometric observations which gave the height of the lake as 1400 feet, a result somewhat less than has been obtained by other observers. On August 23rd porters and guns had been procured, and the expedition started on its westward route, passing, during the first two days, over the undulating country that borders the lake. They then ascended the abrupt escarpment of the plateau, which here rises to a height of 4500 feet. Beyond this the plateau slopes down till, at a distance of about 30 miles from the Loangwa, it is only 3000 feet above the sea-level. No perennial stream was crossed except the Bua, and no vale or glen interrupted the uniformity of the surface. The vegetation was poor: a few open forests of stunted trees gave a little colouring to the scene. The inhabitants are few, and miserable, like the country, for they dwell between the Zulu chief, Mpeseni, on the south-west, and the district of Mwasi on the north-east, and are therefore exposed to attacks from both sides. Such is not the universal character of the plateau. To the south and north the country is pleasantly diversified by hill and dale, is watered by numerous streams, and supports a large population.

Descending to a depth of 1000 feet from the plateau, the expedition came to the village of the Babisa chief, Kabwire, and thence a short march brought them to the banks of the Loangwa. It is here 100 yards broad, and lies at an altitude of 1700 feet above sea-level. After crossing the valley the caravan had to ascend the so-called Muchinga mountains, which present an unbroken front 2200 to 4500 feet in height. They are really the edge of the plateau. Of the Lokinga mountains nothing could be seen, except a few isolated granite domes and peaks, which rise to a height of 500 or 600 feet above the level of the plateau, and to an absolute height of close upon 6000 feet. They trend north and south, and mark the watershed between the basins of the Loangwa and the Luapula. During this part of the journey small-pox broke out among the porters, and water was sometimes very scarce. At length the expedition reached Chitambo's village—not the old Chitambo where Livingstone died, but a new settlement further to the west. It is situated in long. 30·7° E. and lat. 12·14° S., and yet Lake Bangweolo could neither be seen nor heard of. To the north, thin forest, interspersed with colossal ant-mounds, continues for a distance of 7 miles, and then follows a great dreary plain where few trees are to be found: this is the country of Lunga. From these observations Mr. Thomson concluded that in the dry season the lake does not extend further south than 11° 55′. He learnt from inquiries that the Lulimalu, which flows through Old Chitambo to the neighbourhood of the new village, then trends west-north-west to meet the Luapula, after receiving the Moenda and Lokulu. The Chambeze, after receiving the tributaries Lombatwa and Lolotikila, enters the Luapula between 11° 50′ and 12° S. lat., and consequently does not enter the lake at all in the dry season. In the wet season, however, the lake assumes much the same form as shown on maps, though it does not even then extend so far south. Its level, as ascertained by Mr. Thomson from observations of the mercurial barometer, is 3750 feet, or 250 feet below the altitude given by Livingstone, and 500 lower than that observed by Giraud.

On October 5th the expedition resumed its march, and, traversing the thin forests of the Kalinde and Ilala districts, came to the Luapula where it issues from the marshy country and forms a well-defined channel 150 yards broad.

Grassy plains, studded with clumps of fine trees and harbouring large quantities of game, skirt the river, and are watered by the Lohombo and Moengashe and their tributaries. Beyond the confluence of the latter the Luapula becomes contracted to a breadth of about 70 yards, and then enters a narrow gorge, through which it rushes with great velocity. At Kalonga, the village of the principal chief of Iramba, it again spreads out to a considerable width, enclosing numerous islands, and with slower current enters on the great bend which leads it to Lake Moero. Over the same rich country, decked with blossoms of many varieties of beautiful plants and swarming with antelopes, eland, kudu, elephants, and other game, the party marched eastwards to Kwa-Kavoi, a village on the watershed and at the edge of a trackless forest stretching southwards to the valley of the Kafue. Thence they marched in a south-easterly direction to Pa-Mkwemba, on the Moengashe river, and, following this river southwards, crossed, at an elevation of 4500 feet, the Kalera hills, which form the watershed between the Congo and Zambesi basins. They then descended into the valley of the Lunsefwa, a fine stream which flows into the Loangwa. On November 4th the village of Mshiri, an influential Iramba chief, was reached. From this point Mr. Thomson proposed to strike westwards towards the Kafue, but the small-pox had again broken out with renewed virulence, and his Atonga porters refused to proceed further from their home, so after a journey through Urenje to the borders of Manica and back, a distance of nearly 180 miles, Mr. Thomson turned his steps towards Nyassa. The route ran south-eastwards across the Lunsefwa to the Chifukunya mountains, and then north-eastwards to the irregular range of mountains which forms the watershed. From an altitude of 3600 feet the caravan rapidly descended to 1300 feet on the banks of the Lukosashe, crossed the great Muchinga range at an elevation of 4000 feet, and again descended to 1300 feet in the Loangwa valley. Mr. Thomson had intended to march straight from the Loangwa to Blantyre, but Matakenya had laid waste the country, and no guide could be procured. He was therefore obliged to travel to Mpeseni's, and it was only with considerable difficulty and much circumspection that he escaped the clutches of that savage. At length, on January 4th, 1891, the expedition returned to its starting-point, Kotakota, and next month Mr. Thomson was able to reach Blantyre, where he was for a long time laid up with the disease from which he has since suffered so much.

Mr. Thomson gives a favourable report of the country he traversed. Its general characteristics are those of the Shiré Highlands, but its agricultural value is much superior. The *tsetse* fly was never seen, and thousands of sheep and cattle might pasture here, wanting neither for food nor water, and never exposed to overpowering tropical heat. Lying at some distance from the Equator, and at an average altitude of nearly 4000 feet, these highlands enjoy what may be called a temperate climate. Though the expedition travelled in the hottest part of the year, the days were never oppressive and the nights were always deliciously cool. The sanitary conditions of the country are exceptionally good for Africa: there are no low-lying malaria-breeding grounds, as in the neighbourhood of Blantyre; the drainage is excellent, and pure water is obtainable everywhere.

Mr. Thomson's route was carefully worked out by dead-reckoning, and checked by astronomical observations, the latitudes of fifty-four places being determined; altitudes were taken by the aneroid, checked by the boiling-point thermometer, and at all important points George's mercurial barometer was used. No difficulty has been experienced in connecting Mr. Thomson's route with those of other explorers, and particularly that of Captains Capello and Ivens.

Mr. Thomson suggests that the name "Livingstonia" should be given to this region.

German South-West Africa.—Last year the Baron von Uechtritz, who is engaged, with the assistance of the Deutsche Kolonialgesellschaft in investigating the facilities for colonisation afforded by different parts of the territory, made a long journey in the interior. From Windhoek he travelled to Witvley, and thence through the little known Omaheke to the Omuramba. Owing to the hostility of the Herero he was obliged to renounce his intention of crossing the Okavango and making for the Zambesi, and accordingly turned westward to the Etosha lake, passing through Grootfontein. The environs of the lake abound in various kinds of game: ostriches were seen daily, and five gnus were shot. The southern shore of the lake is specially adapted for colonisation. As elephants were said to be plentiful along the lower uninhabited course of the Kunene, Baron von Uechtritz, with his party strengthened by the addition of twelve Bushmen from Amutuni, marched through the Ovambo country to Unkuambi and Ombanja, and at length reached the Kunene opposite Humbe. Here, and further up stream, the river bed is filled with islands; the main channel is 75 to 100 yards broad, and appears to be deep enough for navigation. The large quantity of water at this point makes it quite credible that lower down the river is still larger, and reaches the sea at all seasons. Along the southern bank not a single human being dwells, but natives are to be found on the northern bank, along the upper and middle courses. The water swarms with crocodiles, and hippopotami are numerous, though hotly chased for food. Reeds grow thickly on the edge of the stream, and thick woods cover the banks. The party followed the river for some distance to avoid the savage Evare that live towards the east; but, finding the bush troublesome to traverse, and coming to a westward bend in the river, they made directly northwards to the tributary, Kalonga, which they struck near the confluence. Its bed was 10 to 20 yards broad. Game was particularly plentiful, and it is worth noticing that the almost extinct giraffe was seen in considerable numbers. Lions were heard every night, but elephants were not to be found on the lower part of the river.—*Deutsche Kolonialzeitung*, January.

The Mizon Expedition.—On September 29th M. Mizon started from Akassa with two steamers, the *Mosca* and the *Sergent Malamine* to ascend the Niger. The water was then very high, and the expedition was nine days in steaming from Akasa to Idda, a distance of 220 miles, which is usually traversed in four days. On October 13th the boats entered the Benue, where, though the water was high, they often grounded. The boats of the Royal Niger Company draw only two or three feet of water, whereas the *Mosca* draws five, and the *Sergent Malamine* eight and a half, feet. All went fairly well as far as Ibi, 250 miles above Lukoja. About three miles above Shiru, however, 110 miles from Ibi and 125 from Yola, the *Sergent Malamine* ran aground on a sandbank, and soon after the water sank and left the *Mosca* also aground.—*Revue Française et Exploration*, January 15th.

AMERICA.

The Mexican Southern Railway.—The State of Oaxaca teems with mineral wealth, and it was from this part of Mexico that Cortes reaped his richest harvest. But, shut off from the north by the ranges of the Sierra Madre, and divided by its spurs into numerous valleys, it has hitherto been inaccessible for commercial purposes. In November last, however, a railway was opened connecting the city of Oaxaca with the Mexican and Interoceanic Railways. Starting from Puebla, at a height of 7000 feet above the sea-level, the line descends to the boundary of the States of Puebla and Oaxaca, and thence by easy gradients to Tecomavaca, which

lies at an elevation of only 1500 feet. The length of this section is 139 miles, and the country it traverses is well populated, and yields all kinds of agricultural produce. After leaving Tecomavaca, the line follows for 15 miles the valley of the Rio Salado, and a little beyond Cuicatlan begins to ascend the precipitous sides of the Tomellin Cañon up to the pass of Las Sedas, 6360 feet above the sea-level. The descent from the pass to Oaxaca is accomplished by comparatively easy stages. This town lies at the head of a long and fertile valley, at an elevation of 5000 feet, and at a distance of 228 miles from Puebla. The sections of the line have been opened to traffic as soon as they were completed, and the financial results have been most satisfactory.—*South American Journal*, December 15, 1892.

British Guiana.—At a meeting of the Royal Colonial Institute, held on December 13, Mr. im Thurn read a paper on British Guiana. Dealing first of all with the extraction of gold, he gave a history of the discovery of the precious metal in British territory and the adjoining colonies of France and Holland, and of the attempts that have been made in earlier times to exploit the deposits. In British Guiana the quantity of gold exported has risen from 250 oz. in 1884 to 101,297 oz. in 1891, and the returns for the first nine months of 1892 gave reason to expect a much larger output in that year.

Along the coast of the colony a very narrow strip of land has been cleared and cultivated, and the banks of some of the chief rivers beyond this strip have been planted here and there. Elsewhere the country is still in its natural condition, and, except in the immediate neighbourhood of the rivers, has hardly been explored. Means of communication are much wanted. A steamer runs once a fortnight from Georgetown to Morawhanna, in the North-Western District, which lies beyond the river Pomerun, and has only recently been colonised. Steamers also run up the Essequibo to Bartica Grove, and along the coast to New Amsterdam. There is one railway in the colony, which runs from Georgetown for a distance of 23 miles towards New Amsterdam; and plans for its extension to the latter town, 40 miles further, are under consideration. Communication with the gold-fields is most urgently needed, and several schemes have been proposed. The most promising plan is to make a light railway, about 20 miles long, from Bartica up the Essequibo to the navigable water above the rapids, on which steamers could ply to the gold-fields on the Potaro. It is proposed to make at the same time portage paths round the worst falls on the Cuyuni and Mazeruni, which will facilitate transport to the gold-fields on these rivers also. At present the supply of labour has been adequately maintained, many men being set free by the greater economy and the improved machinery sugar-planters have been obliged to adopt in consequence o sharper competition, while idlers and disreputable persons are attracted to the mines by the expectation of large winnings. These sources of supply will, however, be exhausted ere long, and then the demand for labour must be met by immigration. Mr. im Thurn considers that Portuguese labourers from Madeira, the Azores, and the Cape de Verd Islands, Chinamen, and West Indian Negroes would be best suited for the work and the climate. East Indian coolies are employed in the sugar industries, but would probably be unable to endure the harder work and rougher life at the gold-diggings.—*Colonies and India*, December 17th, 1892.

Argentina.—Herr Hauthal was sent out last June to inquire into the character of certain coal-fields reported by a *Gaucho* to exist in the cordillera of San Rafael. He discovered extensive seams belonging to the true Carboniferous strata lying at an elevation of 10,500 feet. At Mitre the stratum was 13 feet thick. These deposits Herr Hauthal holds to be a prolongation of the coal-formation of San Juan. In the *Cerrillos* near the town of Mendoza he found traces of ancient

moraines. Herr Hauthal also visited several places in the neighbourhood of the same town where hot springs occur. Three leagues distant lies the bath of Borbollon, where the water has a temperature of 77° F. and a bluish tinge.—*Globus*, Bd. lxii. No. 24.

Railways in the Andes.—*Petermann's Mitt.* Bd. xxxviii. No. 72, contains a note by Dr. Phillippi of Santiago on the lines in construction, or projected, over the Andes. The Oroya railway, which has already been referred to in the *S.G.M.* (vol. ix. p. 265), has reached the eastern side of the cordillera, now that the tunnel of Galera is completed. Traversing a distance of 105 miles from Callao, it attains an elevation of 15,659 feet. The tunnel has a length of more than 7¼ miles, and the water which drips from its vaulting in considerable quantities is carried off on either side by two canals running parallel to the lines. At present this is the highest point reached by any railway in the world. The line from Arequipa to Puno attains its culminating-point, 15,646 feet, at Crucero Alto near Vincocaya, and on the railway which is already completed to Oruro, and is being continued to La Paz, the highest point, at Carcoto, is only 12,009 feet above sea-level, which is also the maximum altitude attained by the Santiago and Mendoza railway.

A project has been laid before the Chilian Government by Señor Bonifacio Correa Albana for a new railway over the cordillera. The proposed route leaves the North and South Railway of Chile at one of the stations Contue or Curico, in about 35° S. lat., crosses the Andes by the Planchon pass, and joins the Argentinian system at Villa Mercedes or Mendoza. The advantages of this route were pointed out when the railway through Uspallata was first proposed. According to Señor Correa's plans the length of the line would be 80 miles, the steepest gradient 47 in 1000, extending over a length of only 7½ miles, and the shortest curve-radius 490 feet. Three tunnels would be required, of an aggregate length of 1100 yards, and the culminating-point would be only 8866 feet above sea-level. Besides facility of construction, this railway would have the advantage of giving easy access to the sulphur baths in the higher cordillera, of providing means of transport for sulphur and wood, which is abundant on the Chilian side, and of passing by San Rafael, where coal and petroleum have recently been discovered. It has been pointed out that the line could easily be prolonged to Vichuquen, but nothing would be gained thereby, Vichuquen being only an open roadstead with a heavy surf.

GENERAL.

Atmospheric Circulation.—In the *Annalen der Hydrographie*, Heft xi. 1892, Professor W. Köppen has published a succinct account of the general circulation of the atmosphere, as far as its laws have been ascertained up to the present day. Such an important subject should be noticed in the *S.G.M.*, and Herr Köppen's article is a suitable basis for a short sketch. In latitudes between 30° N. and S.—or thereabouts—and the Poles are found three currents: a surface current of no great depth flowing towards the Pole; an intermediate current flowing towards the Equator; and an upper current directed towards the Pole. Within 30° on either side of the Equator the lower Pole-seeking current is absent. Furthermore, these currents have an easterly direction owing to the rotation of the earth. Such, in bare outline, is the theory, first enunciated by Mr. James Thomson in 1857, but subsequently demonstrated mathematically, and shown to be in accordance with observed facts by Dr. Ferrel, with whose name it has always been associated. Professor Overbeck also has treated of the upper currents, and drawn a diagram showing the looped curves in which they flow. A stream of cold air from the Pole appears at first as a wind blowing eastwards, but by degrees the

effect of the friction of the Earth's surface, transmitted by convection currents, makes itself felt, and the stream turns gradually southwards until, owing to the increase in the radius of rotation, it loses so much of its easterly velocity as to appear as a wind blowing towards the west over the Earth's surface. From the upper Equatorial regions a return current, flowing towards the Pole and quickly losing its relative western motion as it proceeds northward, reaches the Pole as a wind blowing eastwards. The prime motive force in this circulation is the heat of the sun, which expands the air within the Tropics, and draws the cooler air from higher latitudes, the heated air in the upper strata of the atmosphere flowing back to fill up the vacancy in the Polar regions. As the air in the higher latitudes exerts by friction an action on the earth tending to turn it towards the east, and in the lower latitudes turning it towards the west, the line where these easterly and westerly components of motion vanish must lie near the 30th parallel, in order that there may be no resultant effect on the Earth ; and the pressure, which depends on these east and west components, will reach a maximum in the lower strata about this parallel. Hence, the lower air will be forced out along the surface of the Earth, giving rise to the third Polar current mentioned above. The exact position of this line of maximum pressure varies at different altitudes and with the seasons. This theory has been confirmed by numerous observations since Humboldt found a strong west wind above the trade-wind, on his ascent of the Peak of Teneriffe in 1820. The movement of the gases thrown into the air by the eruption of Krakatau, and observations on clouds, are quite in harmony with the theory.

Ferrel's application of the principle that the resultant effect of the action of the particles of the atmosphere on the Earth's rotation must be nil is not strictly justifiable, as Mr. James Thomson pointed out in a paper read before the Royal Society last year, seeing that an external force, viz. the sun's radiation, is present ; but experience proves that any resultant force that may exist, tending to retard or accelerate the Earth's rotation, must be insignificant.

Another point has not been clearly understood by readers of Ferrel's book, and that is, how the air which flows towards the Pole down the steep gradients of the upper stream can return to the Equator, for it is a well-established fact that a maximum pressure exists about the 30th parallel, whereas the pressure in Polar regions is less even than at the Equator. Were the gradients produced solely by differences of temperature, we should expect to find a slight excess of pressure in the colder regions on the ground, and the isobaric surfaces inclined towards the warmer regions in the lower part of the atmosphere, and towards the colder in the upper part ; whereas, in fact, they are inclined towards the Pole in all strata of the atmosphere, except in the Tropics. The explanation, as Professor W. M. Davis has well explained, is to be found in the effect of the Earth's rotation. The great velocity, and consequent centrifugal force, which the air acquires during its course towards the Pole in the upper strata of the atmosphere enables it, on its return journey, to force its way obliquely against the weaker gradients of the lower strata. The high pressure at the 30th parallel is the result of these vortex motions. The lowest current, owing to the diminution of its velocity by friction, instead of helping to produce pressure, is obliged to follow the gradients, and hence moves Polewards.

It is still an open question at what latitude the upper Polar stream moves directly towards the Pole. The latitude certainly varies with the altitude, but it appears never to lie more than 10 degrees from the Equator. Not only theory but actual observation shows that the limit of easterly winds moves nearer to the Equator as we mount to greater altitudes.

Professor Köppen also discusses the velocity of wind. If a mass of air, which

at latitude 30° was at rest relatively to the Earth's surface, were transported to latitude 50° without being subjected to friction, it would there meet with a surface which rotates 338 feet per second slower, while it would itself, owing to the shortening of its radius of gyration, have increased its easterly velocity by the same amount. It would, therefore, appear as a west wind, blowing at the rate of 676 feet per second ; and at 60° this rate would increase to 1108 feet per second. That the actual velocities of air-currents, even in the higher regions, are far below these values, is proved not only by observations of clouds and on high mountains, but also by the distribution of pressure, for high velocity is compatible only with steep gradients. Of the actual velocities of winds and the distribution of pressure and temperature, much information is constantly being acquired, though much remains to be done in this direction. Of the force of atmospheric friction, caused by the intrusion of volumes of air from one current into another, and the effects of diurnal and other changes of temperature, mountains and other physical features, in changing the velocity of air-currents, comparatively little is known at present. Professor Möller, in the *Meteor. Zeitschr.*, 1887, set forth reasons for believing that volumes of air moving in different directions, and with different velocities act, after intermingling, like two rigid inelastic bodies, which after impact, move onwards in the same direction and with the same velocity, the sum of their *momenta* remaining unchanged while their total *vis viva* is diminished.

At present, observations of temperature and pressure in the middle and upper strata of the atmosphere are urgently needed, as well as records of the movements of clouds, taken on mountain summits, on high towers, or in balloons. It is, therefore, a subject for congratulation that, in consequence of a decision of the Meteorological Congress, held at Munich in 1891, records of cloud movements will be commenced in May 1894 at many stations in all parts of the world. The necessary instructions will be drawn up by Professor Hildebrandsson of Upsala, under whose supervision a series of valuable observations has already been carried out in Sweden.

MISCELLANEOUS.

Captain Nelson, who took part in the Emin Relief Expedition, died at Zanzibar on December 26th. He was an Honorary Fellow of this Society.

Herr L. Friedrichsen has forwarded a reproduction of **Sir Walter Raleigh's Map of Guyana**, 1595. It embraces the north coast of South America from the Isthmus of Panama to the mouth of the Amazons.

An expedition left England last October, under the leadership of Lieut. C. H. Villiers, to ascend the Juba River into **Somal-land**. It is accompanied by Mr. Gregory of the Geological Department of the British Museum.

Last December the first section of the **railway from Saloniki to Monastir** was opened. It terminates at Vertekop, and is nearly 60 miles in length. The remaining portion will probably not be completed until the middle of next year. —*Revue Française et Exploration*, Jan. 15th.

The *Revue Française et Exploration* reports that a letter has been received from the **Duke of Orléans**, written on Dec. 10th, at a point 25 miles to the east of Harrar. He had crossed a range of mountains 5500 feet high. After drawing up a map of the country between Harrar and Milmil he intends to return to Berbera.

The Minister of Public Works has taken up the question of the prolongation of the **railway from Biskra to Wargla**, in Algeria. The section from Biskra to Tuggurt, 130 miles, will have six stations, and that from Tuggurt to Wargla will be

105 miles long, with five stations. The gauge will be 3 ft. 5 in. The cost of construction is estimated at £989,200, or about £4200 per mile.

The *Annalen der Hydrographie*, Heft xii. 1892, contains a chart of the new harbour of **Leixões, near Oporto**, at the mouth of the river. It was completed last year, and the *Elbe*, of the Royal Mail Steam Packet Company, was the first transatlantic steamer to enter it, on March first; since then many other large vessels have anchored in the harbour. Quays are to be built at which cargoes may be transferred directly to the railways.

NEW BOOKS.

Ancient India: Its Invasion by Alexander the Great. By J. W. M'Crindle. Westminster: A. Constable, 1893. *Price* 18*s. net.* Pp. xv + 432.

We heartily congratulate the author of this valuable work on his having been spared to add another volume to the valuable series of books already published by him. We think it right to recapitulate them:—(1) *Indica of Ktesias anterior to Alexander the Great;* (2) *Indica of Megasthenes;* (3) *Periplus of the Erythrean Sea;* (4) *Ptolemy's Geography of India and Eastern Asia.* This fifth volume comprises translations of Arrian, Quintus Curtius, Diodorus Siculus, Plutarch and Justin, as far as they relate to the invasion of India by Alexander the Great, B.C. 327. A sixth, which will contain a translation of the chapters in Strabo's Geography descriptive of India and Ariana, is in preparation; and this will complete the remarkable series.

The writer of these remarks has been familiar from his youth with the regions in Northern India traversed by the Macedonian hero, having passed several years on the banks of the river Hyphasis, the modern Beas, the *ne plus ultra* of the great Conqueror, and he has dropped down the great river to the sea, thinking of Alexander. As each of Mr. M'Crindle's books came to hand they were read and appreciated: he has occupied one peculiar corner of history and geography, and it is only in the last half-century that our general knowledge has been sufficient to test the accuracy of the Greek and Roman historians. A cloud of darkness had fallen in the Roman period over Eastern Asia, and has only been lifted up in this century after the occupation of India by the British Power. Truth has been separated from fiction, which Juvenal sneered at—

> "quicquid Græcia mendax
> Audet in historia"—

and we are greatly indebted to our author for the calm, thorough, and critical way in which he has disposed of a peculiarly difficult subject. Nothing but praise is deserved by this scholarly book—sufficiently long to comprise all that was necessary to elucidate the subject, sufficiently condensed to attract the reader. This series of books will remain as monuments of the industry and acumen of the esteemed writer.

The Story of Africa and its Explorers. By Robert Brown, M.A., Ph.D., F.L.S., F.R.G.S. Vol. i. 200 Original Illustrations. London, Paris, and Melbourne: Cassell and Co., Ltd., 1892. Pp. 312.

It has been said, and well said, that although the British have for years had far more than a sentimental interest in Africa, yet that the majority of our people know remarkably little about that country. It will not be the fault of either the writer or the publisher of the book before us if this ignorance still continues, for a

more fascinating history can hardly be imagined than that presented to the reader, whilst the profuse and artistic illustrations are an education in themselves, and must, one would think, entice even the least curious to study the subject of which the book treats. It is highly probable that a great deal of the ignorance which exists respecting Africa has been due to the mass of literature which has been published, its sameness, and the want of a concise, well-written, and connected account of the history of the opening up of that continent. In Dr. Brown's pages we find exactly what is wanted—an attractive style, admirably condensed material, and a well-balanced exposition of an intensely interesting chapter of the world's history.

The first volume deals with the Guinea traders, the Corsairs of Africa, the tale of Timbuctoo and the Niger, and commences with an introduction dealing with the early history of Africa from the time when Menes founded the city of Memphis to the present day. The past history of Africa, as is well shown by Dr. Brown, may be read with great advantage, and is replete with instruction, which it would be well to lay to heart at the present time, when European nations are all so interested in what has been called "the hopeless continent." If we turn for a moment to the vivid description of the slave-trade as carried on at the commencement of this century, we learn at once that it is hopeless to expect to put it down by harassing the slave routes or by blockading the coast. We read clearly enough that it was only when the demand for slaves ceased that the West African slave-trade came to an end; and if we wish to put a stop to the slave traffic on the east coast of the continent, it will only be by acting as our forefathers did, and obtaining the abolition of the slave-markets in Morocco, the remoter parts of Tripoli and Tunis, on the frontier of southern Algeria, in Arabia, etc. The description of the Corsairs of Africa forms a highly interesting chapter, and shows clearly enough the difference between the pirate of fact and of fiction. Captain Edward England, George Lowther, Davis, and Bartholomew Roberts, are all described, with many others, in graphic sentences. The history of the Niger, the story of Mungo Park, and the search after Timbuctoo, are all given in a series of vivid pictures, and the account of the various West African companies is fascinating in the extreme. Indeed, after commencing to read, it is difficult to lay down the book.

A special word of praise must be said of the illustrations, which are not only artistic and spirited, but remarkably accurate. We have rarely met with a like publication of equal power and interest.

Egypt To-Day. The First to the Third Khedive. By W. Fraser Rae. Bentley. Pp. 331. *Price* 16*s.*

Mr. Fraser Rae has contrived, in a very moderate space, to give a clear and succinct view of the present condition of matters in Egypt. For some persons the Egyptian question is one of finance; for others one of justice; for others again of irrigation; and accordingly the writer, a skilled *littérateur*, has arranged his information under these headings, as well as under others, such as Education, and Public Opinion. To make *Egypt to-day* intelligible, the author shortly describes the Egypt of yesterday, and points out the vast and almost incredible improvement that has taken place in every direction within the last ten years, constituting a splendid monument of the administrative capacity, on so many lines, of our countrymen. He refers to the persistent obstruction by the French, and the violent abuse of our administration by their newspapers, as being hardly consistent with international comity, besides to some extent hampering our efforts. Possibly a firmer line of conduct, and one more consistent with the responsibilities we have assumed, or have had thrust on us, might with advantage have been adopted from

the beginning. We do not understand, by the way, in what sense Mr. Rae asserts that "Egypt is no longer England's stepping-stone to India."

He points out, shrewdly, that the enormous and crushing debt of a hundred millions incurred by Ismail Pasha really brought about the regeneration of the country, as the European Powers insisted on reformation in the interest of the bondholders, and that the taxes are now not only relatively lighter than when there was no debt, but are levied with perfect equity. This does not, however, he says, so much excite the popular gratitude as does the fairness with which the water irrigation is distributed, and its increased amount. His account of all that has been done, and has to be done, in this department is of special interest.

The Beauties of Nature and the Wonders of the World we Live in. By the Right Hon. Sir JOHN LUBBOCK, Bart., M.P., F.R.S., D.C.L., LL.D. 8°. Pp. xiv + 427, 12 Pls., 55 figs. London and New York: Macmillan and Co. 1892.

Naturalists owe much to the author of "*Ants, Bees, and Wasps*," "*Wild Flowers in Relation to Insects*," "*Flowers, Fruits, and Leaves*," "*Seedlings*," and other works, and this debt must not be forgotten when dealing with the pleasant, well-written book before us. Every book should be judged in relation to the ends it is to serve; and although there is no preface to tell us what the purpose of this book is, we suppose that Sir John Lubbock desires to stimulate an enthusiastic interest in nature. For this the book seems to us well suited; and we can recommend it to those whose eyes have been opened to "the wonders of the world we live in," but who do not wish to take them very seriously. In a charming style, though with more quotations than severe literary critics deem good art, Sir John tells us of certain aspects of nature which he and others have found delightful and impressive. Of animal life he tells us a little, but we would fain have heard more about his ants and less about "animal individuality"; of plant life he writes, but why does he give to seedlings (on which he is an authority) only a paragraph? Then there are chapters on woods, fields, and mountains, on rivers, lakes, and seas; and the book ends with enthusiastic admiration of the starry heavens. The facts in the book are for the most part familiar to those who look out on the world with intelligent eyes, but they are simply and pleasantly stated; the reflections on the facts are those of a cultured gentleman rather than of a critical naturalist; indeed, the excellence of the book lies in its spirit—that of a careful observer and reverent lover of nature. The student who hopes to find here the mature results of Sir John's long experience as a naturalist will be disappointed; he may even be irritated by hearing that "it is curious that no plants, so far as we know, grow in the depths of the ocean," that "Arthur's Seat, near Edinburgh, appears to be the funnel of a small volcano belonging to the Carboniferous period," that "it is to insects that flowers owe their beauty, scent, and sweetness," that "it is difficult altogether to deny to ants the gift of reason," or that "the Atur parrot, mentioned by Humboldt, talked, but could not be understood, because it spoke in the language of an extinct Indian tribe." But it was not for the critical student that this book was written. It is a series of light studies for leisure hours, and as such it is excellent. The book is well printed, and most of the plates have been well reproduced.

Morocco as it is: with an Account of Sir Charles Euan Smith's recent Mission to Fez. By STEPHEN BONSAL, Jr., Special Correspondent of the *Central News*. London: W. H. Allen and Co., 1893. Pp. 349. *Price 7s. 6d.*

An interesting book on a subject of much importance to Great Britain. Its author is an American, who takes an impartial view of the "Western Question,"

which has of late years attracted almost as much European interest as the Eastern one. He reminds us that Tangier, with its undefined *Hinterland*, was once a British possession, being part of the dowry of Catherine, Infanta of Portugal, who married Charles II. In 1664, Lord Teviot was Governor of Tangier, and lost his life in a skirmish with the Moors. It was here also that John Churchill, afterwards the great Duke of Marlborough, first saw active service.

British policy has long discouraged any European settlements on the African side of the Straits of Gibraltar; but the designs of France and Spain, and the decay of the authority of the Moorish Sultan, have now made our Foreign Office change its policy. With the view of persuading the Sultan to sign a commercial treaty with Britain, Sir Charles Euan Smith was sent to Fez in the spring of 1892; and in this volume we learn what took place there, and also the text of the treaty itself, which, as is well known, the Sultan rejected.

With regard to the Sultan, Mulai Hassan, Mr. Bonsal describes him as a handsome, vigorous man, whose age is uncertain, some stating it at forty, others at sixty years. A warrior and sportsman in his youth, he still spends half the year under canvas. In 1884 he was seriously ill, and great political ferment ensued, but this subsided on his recovery. Five rebellions in 1892, however, have greatly disturbed him, and indicate the near approach of the disintegration of his empire.

Mr. Bonsal reached Fez several months before the British mission under Sir Charles Smith, and heard the damaging tales which French and Spanish emissaries poured into the ears of the credulous Moors long before Sir Charles appeared upon the scene. This was on 12th May, and on 5th July the negotiations for the treaty were as backward as ever. On the latter date the Moorish New Year began, and a riot ensued, in which several members of the British Legation were injured, and the British mission-house in Fez was besieged. The Sultan himself begged Sir Charles Smith to come with his wife and daughter for safety to the palace, as their lives were in danger owing to false rumours having been spread abroad before the mission arrived. On the 8th July the Sultan was informed that, if he signed the British treaty, France would reconsider her attitude in the Touat question, and on the 9th the Sultan's vizier offered Sir Charles a treaty which granted no concessions whatever to British commerce. Sir Charles tore this up, and shortly afterwards left Fez for Rabat, its seaport.

A variety of other subjects is discussed in this volume, one chapter being devoted to Slavery in Morocco. The author states that the demand, which is now principally for female slaves to replenish the harems, is supplied by the great caravan-merchants, who make annual journeys, in the month of October, from Tendoof, in South-Western Morocco, to Timbuctoo, and return with 3000 or 4000 slaves, on which the Sultan of Morocco levies a tax of 10 per cent. Mr. Bonsal's style is not free from faults; but his book is valuable as being the work of one who describes what he has seen. A good map of Morocco, and numerous illustrations, complete the volume.

La France et l'Angleterre en Asie. Par PHILIPPE LEHAULT, Membre de la Société de Géographie, Explorateur en Asie. Tome 1er: Indo-Chine. Les derniers jours de la dynastie des Rois d'Ava. Paris: Berger-Levrault et Cie., 1892. Pp. xvii and 772. *Price* 10 *frs.*

This volume deserves the attention of the student of foreign politics and political geography, because it is highly desirable that he should be familiar with the claims advanced and the points of view assumed by French writers in matters which are inevitably coming to the front. But these are for the most part burning

questions which in these pages we can only indicate, and are precluded from discussing.

It is sometimes difficult to ascertain the precise historical basis of French territorial claims, which are nevertheless asserted to be indefeasible and above discussion. As regards Indo-China, however, M. Lehault is explicit enough. The fact of having planted the French flag at the mouth of the Mekong, to say nothing of the famous voyage of Garnier and Doudart de Lagrée, is held to give to France undoubted rights over all the territories watered by that great river from its mouth up to its source. This includes, of course, on the lower river, a large slice of the kingdom of Siam, and on its upper waters some of those Shan principalities, the suzerainty of which has fallen to us along with the kingdom of Burmah, but to which M. Lehault nevertheless refers as "nos vassaux"! We cannot attach as much value as we should wish to his notices of the different Shan districts, for description is here evidently subservient to the desire to prove their previous independence of Burmah. The writer is a warm advocate of the Franco-Russian Alliance, and pronounces the claims of Russia in the Persian Gulf to be as legitimate and as worthy of support as those of France in the Shan States. This we will not dispute.

As occasionally happens with French writers, the spelling of English names and English titles is a stumbling-block to the author.

De Koulikoro à Tombouctou. A bord du "Mage," 1889-90. Par le Lieutenant de vaisseau G. Jaime. Illustré de 31 gravures et 4 cartes. Paris: Dentu, N. D. Pp. 436. *Price* 8 *frs.*

This volume contains some valuable and interesting details, not only of physical geography, but also with respect to the natural resources, and the character and tendencies of the different tribes, in the region watered by the Niger between Koulikoro (a little below Bammako, where the navigation of the Upper Niger begins) and Timbuctoo. The writer pronounces the whole region to be of little value economically, though politically it may be of importance as forming part of the proposed French quadrilateral, of which the Senegal and Lake Chad—or indeed the Ubangi—constitute the SW. and SE. corners respectively. The soil is very poor, and even where the water-supply is sufficient, viz. near the river or on the inundated plains, the vegetation is meagre and cultivation difficult.

The writer quotes the small cost of transmission of merchandise by the river as against the probable commercial success of a railway. On the other hand, this section of the river is very defective as a waterway. In its upper reaches it has quite a torrential character, and for some months in the year is practically dry. His details on this subject are very curious. At some distance above Timbuctoo the river enters the great Lake Deboë, leaving it by a narrow outlet. In consequence, the flood season arrives at Timbuctoo very much later than higher up; and, owing to these conditions, the river-course below Timbuctoo is much more even, and the navigable season longer by some months than above. Great migrations of fish take place, up and down the river, according to the volume of the water. The author has a good deal to say on the subject of slavery. In the old French settlement of St. Louis, Senegal, a great part of the population consists of slaves. The difficulty, we are told, is to know how to alter this, for a captive once marked and known as such cannot, the writer says, provide for himself or change his condition, as he would be seized in any of the villages and detained for reward. But he mentions, without comment or disapproval, that the French commanders, after a successful fight, reward their native supporters with gifts of "captives." Slaves in

French territories, he says, are only known under this euphemism. Nevertheless, the facts he relates hardly bear out his assertion that the anti-slavery feeling is stronger in France than in any other country.

Problèmes Géographiques. Les Peuples étrangers chez les Historiens chinois. 1. *Fou-sang Kouo. Le pays de Fou-sang.* Par GUSTAV SCHLEGEL. "*Extrait du Toung-Pao*, vol. iii. No. 2." Leide: E. J. Brill, 1892. Pp. 68.

In the middle of the last century, De Guignes announced that he had found in ancient Chinese annals that, in the fifth century A.D., a country called Fou-sang had been discovered by some Buddhist priests, and he believed it to be Mexico. This gave rise to a lively exchange of opinion among Chinese scholars, some of whom supported the identification, while others denied it. The author solves the difficulty by collecting every Chinese reference that he can find, and adding a Chinese map, in which Fou-sang is laid down, for its position is no mystery to the Chinese. It is in fact the island of Krafto or Karafuto, in our maps erroneously called Saghalien. Fou-sang means the east, but literally "the supporting mulberry," the tree from which the rising sun was supposed to proceed. Its inhabitants were Ainos, who in former times must have been more civilised than now, for they are credited with possessing the art of writing and of making paper from the bark of the Fou-sang.

Les Races et les Langues. Par ANDRÉ LEFÈVRE. *Bibliothèque scientifique internationale.* Ancienne Librairie Germer Bailliére et Cie. Paris, 1893. Pp. 301. *Price 6 frs.*

To summarise such a vast subject as the races and languages of mankind into three hundred readable pages is a formidable task. It has been partially accomplished in this instance by practically omitting the races, so that the title is in some measure a misnomer. As professor of Anthropology, and an adherent of the doctrine of the evolution of man from an earlier anthropoid, the author begins by showing that there is no impossible gulf between the language of birds, primates, and human speech; that human language developed in several centres, partly from the imitation of natural sounds. His rehabilitation of the so-called "bow-wow" theory, upon which so much ridicule, sometimes deserved, sometimes unmerited, has been cast, is very spirited. Absolute demonstration is impossible, but the various ways in which early man's vocabulary gradually became enlarged by quite simple expedients is very reasonably sketched out. The evolutional order of language is from monosyllabism through agglutination to inflection, corresponding to three stages of intellectual growth and natural capacity. Here he differs from Professor Sayce, who maintains that an inflectional language has always been so. M. Lefèvre supports the older view that the original cradle of the Indo-European languages is to be found in Asia, not in Europe, and in other respects he still holds to the older linguistic theories. In a work of this kind it is astonishing to find no mention of the results of the so-called "young grammarians" of Germany, and even Werner's important law is passed by without notice, though the Teutonic languages cannot be adequately explained without it.

The relationship between the Libyan and Semitic languages is still a matter of dispute among the learned. M. Lefèvre accepts the kinship, but the separation must have occurred before any great development of the common language had taken place, and at a later period one stood still, while the other advanced to the inflectional stage. The original home of these Libyo-Semites was probably the North-African seaboard, and the Semites swarmed off in an easterly direction into

Asia. On the ground that there are no large monkeys, not even in a fossil state, in the continents of North and South America, the author can scarcely believe that the natives of these regions are autochthonous. His opinion is that they came in successive swarms from Asia across the Behring Straits. A question that touches us more nearly in Scotland is the relationship between the Celts and the Gauls. Ethnographically they are distinct, but in historic times they spoke the same language. One of the two must have imposed its speech upon the other. Which of them was it? Here, unfortunately, M. Lefèvre is unable to supply us with a decided answer, and the question still remains an open one. In spite of the *lacunæ* above referred to, there is much to commend in this book, which is replete with discussions of many interesting problems.

Deutsch-Ostafrika. Das Land und seine Bewohner, seine politische und wirtschaftliche Entwickelung. Von Paul Reichard. Mit 36 Vollbildern nach Originalphotographien. Leipzig, 1892. Pp. 524. *Price* 9 *m.* 60 *pf.*

The story of German activity and attempts at colonisation on the East Coast of Africa has practically, up to the present, only appeared in newspapers and magazine articles. It is therefore with considerable interest that we take up this book, which professes to give an account of the stirring events which have occurred in East Africa since 1884, when Dr. Peters left Germany to try to found a great colony in Africa.

Paul Reichard does not write from hearsay. He has resided in Africa for some years, and he has been present through most of the events which he describes in this volume. He is therefore well qualified for his task, and he has performed it exceedingly well. The description given of the action of Dr. Peters, and subsequently of the German Government, in obtaining the protectorate in Usagara, etc., is accurate; and the author lets it be clearly seen that although he believes a civilised power is justified in obtaining lands and treaty rights from the Negroes, by any method likely to be successful, yet he acknowledges that the Sultan of Zanzibar had a good title to the country obtained, and that England was simply coerced into abandoning her rights by the energetic and firm action of the German Foreign Office. Reichard's description of the geology, agriculture, and climate of East Africa is very good, and the author has evidently taken pains to keep well within the mark, and not to give expression to exaggerated descriptions which impair the value of so many books. The remarks on disease, clothing, and acclimatisation are also admirable, as is his description of the mixed population of Zanzibar and of the natives on the mainland. Referring to the Arabs, his comparison of the efforts made to suppress them and Koch's cure for consumption is amusing. He says that as Koch's tuberculine is said to spread the disease, so he holds that the suppression of the Arabs at the coast served to scatter them, with all the evils they entail, upon the innocent population in the interior. He also expresses the opinion that for a great deal of the slave-dealing the Hindus at Zanzibar are to blame, and that, as the said Hindus are British subjects, England is to blame for not preventing them supplying the Arabs with the funds whereby alone they can carry on their nefarious trade.

The description of the troubles on the East Coast, and of the fighting which they entailed, appears to be accurate, and the causes which led up to it are detailed succinctly.

We are glad to see that Reichard, differing from many of his countrymen, objects to the introduction of spirits into East Africa. He acknowledges that it would be a profitable trade, but he points out that it would simply ruin the

natives and prevent all legitimate trade with them. He frankly acknowledges that it is, and will continue to be, a difficult matter to create a paying colony on the east coast of Africa ; but at the same time he appears to have confidence in the future prosperity of the country. The book is profusely and well illustrated, and is written in an attractive style.

Across France in a Caravan. By the Author of *A Day of my Life at Eton.* Edinburgh and London : Wm. Blackwood and Sons, 1892. Pp. 408.

The author gives a lively account of a journey he made, during the winter of 1889-90, from Bordeaux to Genoa. He purchased from "a gentleman of the travelling amateur photographic persuasion" a caravan which accommodated himself, his wife, his servant, and their dog; and in this primitive way they traversed the valley of the Garonne, from Bordeaux to Toulouse, crossing thence to Narbonne and, after skirting the Gulf of Lyons to Marseilles, followed the Riviera to Genoa. The caravan, which was named the *Escargot* (Snail), was built in England, whence it was shipped to Bordeaux, where our travellers began their caravan experiences, the French police requiring them to take out a "certificate of respectability" to ensure their safe passage through the less frequented districts of France. Their collie dog came also under police supervision, and they were reprimanded for "taking about wild animals without a muzzle"; but muzzling their collie only made him more uncontrollable. They purchased in Bordeaux a pair of fine-looking Breton mares, which drew the caravan the whole 750 miles from Bordeaux to Genoa, and were in better condition at the end than the beginning of the tour. A French jockey named Joseph was engaged as man-of-all-work.

Unlike Dorothy Wordsworth, who when describing the tour which Wordsworth, Coleridge and she made from the English Lakes to the Scottish Highlands, subordinated the commonplace to the picturesque, the author of this book deals with the commonplace rather than the picturesque, and often narrates incidents which might have occurred anywhere. The illustrations, which are by Mr. John Wallace after sketches by the author, are, however, admirable. The author assures us that the portrait of a French gentleman out shooting, with a French horn slung round his neck, is not a caricature, but is that of a "Chasseur Français" he actually saw shooting sparrows just before the caravan reached Finhan.

At Toulouse, a rival caravan, nearly as large as the *Escargot* came into the same yard, and turned out to be occupied by strolling players, with whom the English party struck up an acquaintance. At Toulon, their nearest neighbours were "a father, mother, two boys, and a very pretty little black-eyed girl," all of whom slept under "a four-wheeled market cart." Moving thus, in gypsy fashion, our travellers at last reached Genoa, "and pulled up on a piece of waste ground at the entrance to the town." Their eventful caravan journey being ended, the *Escargot* was shipped to London, reaching home about six months after she had left it. A good map clearly shows her route from Bordeaux to Genoa.

Our Wherry in Wendish Lands. By H. M. Doughty. London : Jarrold and Sons, N. D. *Price* 15*s.*

In Mr. Doughty's handsome volume we have an interesting account of a trip in a Norfolk wherry from Holland, through Germany, to near the confines of Bohemia. The wherry itself is described as follows :—"She is a strong and a graceful model, clinker built. Her length 53 feet, her beam 13 feet 6 inches, her draught 3 feet, or, with her shifting keel off, only 2. Her one mast, very far forward, is as high nearly as her length, and, balanced in a tabernacle with a ton and more of lead,

could be lowered and raised by the strength of a child. Few bridges are too low for her. Her rigging is of the simplest: there are no shrouds, but one sail with very high peak and an enormous gaff; no boom."

Mr. Doughty and his daughters made this trip in 1890. They sailed from Leeuwarden in Friesland through North German canals to the mouth of the Elbe, and up that river to Dömitz, where they traversed the wonderful waterways of Mecklenburg-Schwerin, returning *viâ* Potsdam to the Elbe at Magdeburg, and sailing up past Dresden to Rathen, 10 miles from the Bohemian frontier, and 500 miles from the mouth of the Elbe.

This extraordinary voyage of 1600 miles through Germany, which was the first of the kind ever attempted, occupied three months, and was most successfully accomplished. The book contains numerous illustrations by Mr. Doughty's daughters, as well as five excellent maps of the country traversed.

Hand-book of the River Plate, comprising the Argentine Republic, Uruguay, and Paraguay. With Railway Map. Sixth Edition. By M. G. and E. T. Mulhall. Buenos Ayres: M. G. and E. T. Mulhall. London: Kegan Paul, Trench and Co., 1892. Pp. 686. *Price* 6*s.*

This, the sixth, edition of the first work of any importance in the English language published in South America, has undergone many improvements, and has been considerably enlarged since its earliest appearance thirty years ago. It is an excellent and handy guide to that part of the world with which it deals, and contains full and detailed information on every point regarding which the ordinary inquirer may be supposed to feel interest. The statistics are remarkably full, and the comparative method adopted in their treatment frequently makes them more valuable to the student than if the more usual course—that of giving figures for the country under review alone—had been followed. To take an instance at the opening of the book, we find on page 21 a short table comparing the wealth of Argentina (£478,000,000) with that of Australia (£1,373,000,000), Canada (£980,000,000), the United Kingdom (£9,400,000,000), France (£8,600,000,000), and the United States (£12,820,000,000); or per head of the population, £130, £343, £196, £243, £224, and £210 respectively. The chapter on the climate of Argentina is of special interest, for not only is the subject gone into in great detail, and illustrated by a large number of tabulated figures, but it includes the causes of death in Buenos Ayres as compared with England. These figures bring out some curious results. For instance, whereas in England 1 in every thousand deaths arises from tetanus, the proportion at Buenos Ayres is as high as 102; from fever in England 11, at Buenos Ayres 40; from small-pox in England 1, at Buenos Ayres 18; from phthisis in England 89, in Buenos Ayres 77; from accidents in England 30, at Buenos Ayres 27; and from old age in England 56, at Buenos Ayres 22. These samples of matter and manner of treatment are sufficient, we think, to show the wide scope and completeness in detail exhibited throughout most of the book. For, although Uruguay and Paraguay are dismissed in 106 pages, yet, in so far as statistics are available, they receive their fair share of description. The book is excellently printed, neatly bound, and has a full and reliable index appended. We note some printers' errors, but these are few. The maps are not very artistic productions, but, upon the whole, this is a most creditable issue, and has our sincere commendation.

A New Geography, on the Comparative Method. With Maps and Diagrams. By J. M. D. Meiklejohn, M.A. Seventh Edition, Revised and Corrected. London: A. M. Holden, 1893. Pp. 1+504. *Price* 4*s.* 6*d.*

It is only about three years since Professor Meiklejohn's *New Geography* was first issued. The edition recently published is the seventh, making the fortieth thousand. No further proof of the success of the book is needed, and little more is required of the reviewer than to record the fact. That success has no doubt been due to the qualities which were pointed out in a former notice of the book in this *Magazine* (May 1889)—to its freshness, its arrestiveness, and its adhesiveness. Professor Meiklejohn is a master of the art of putting things. He does not fear to sacrifice literary purity—just as he does not hesitate to sacrifice scientific accuracy—for the sake of a racy description or a telling contrast.

We note with pleasure that Professor Meiklejohn has corrected most of the inaccuracies pointed out in our former notice. But the Balkan railway is still referred to as a thing of the future, and Western Australia is still spoken of as having no parliament of its own. We observe also that Mr. H. M. Stanley is still described as "the present Governor-General of the Congo Free State." The recent distribution of "spheres of influence" in East Africa is described in a supplementary lesson on pp. 371, 372; but no reference is made to the British Protectorate of Zanzibar, which is still described merely as "an Arab Sultanate." Perhaps the most curious "correction" is the reduction of the height of the Falls of Niagara from "160 feet" in the first to "120 feet" in the latest edition.

The new edition is adorned with a coloured double map of Africa—physical and political—by Bartholomew and Co., and is enriched with a copious index.

Wie gestaltet sich das Wetter? Eine praktische Anleitung zur Vorherbestimmung der Witterung. Von H. Timm. Wien, Pest, Leipzig. Mit 74 Abbildungen. Pp. 175.

This is an admirable little book, which has for its object the popularising of meteorology. It is written plainly and concisely, and, whilst theory is not neglected, it is very practical. We wish we had some such book published in English. The author gives a clear description of the nature of the instruments required for meteorological observations, and provides easily understood rules for their use. He gives a good description of the optical phenomena of the atmosphere, and explains how the weather forecast and charts in the newspapers can be utilised. We also find a short chapter containing instructions on weather-forecasting, when one has no information respecting the weather obtaining over large districts. There is also a short but useful chapter on the influence of climate upon health. The illustrations are good, and we have nothing but commendation for the work.

Le Mexique. Par Gaston Routier. Paris: Librairie H. Le Soudier, 1891. Pp. xvii+110.

The contents of this useful volume originally appeared during the latter half of the year 1891, in five parts, in the *Bulletin de la Société de Géographie de Lille.* We welcome the appearance of the work in its present complete form, as it is among the best and most useful geographical accounts of Mexico that we have seen for some time. By this we do not mean to imply that the work is in all respects exhaustive, but, so far as it goes, it is exceedingly well executed. The heads under which the author has chosen to describe the country are those of its geographical limits, orography, hydrography, agriculture, flora, fauna, mines, manufactures, and trade. All these are treated succinctly, clearly, and with well-sustained balance

and the writing, so far as the subjects admit of this, is bright and interesting. The preface has been supplied by Don Ignacio Altamisano, of whose biography some details are given which might have been omitted. There is a good map, but the index is the worst it has been our lot to peruse.

Voyage of the Nyanza R.N.Y.C. Being the Record of a Three Years' Cruise in a Schooner Yacht in the Atlantic and Pacific, and her subsequent Shipwreck. By J. Cumming Dewar, late Captain, King's Dragoon Guards and 11th Prince Albert Hussars. With Map and Illustrations. Edinburgh and London: William Blackwood and Sons, 1892. Pp. xviii + 466.

To those who imagine that a yachting voyage round the world, or even on a more than usually extended scale, is all pleasure and without disappointment and discomfort, the perusal of this record of an unfortunate and disagreeable voyage may be recommended. Unfortunate and disagreeable it was in many ways, the almost continuous disputes with the officers and troubles with the crew culminating at last in shipwreck. Who was to blame for this unhappy state of affairs we have no means of judging; but a feeling of discomfort pervades the narrative, and makes the reading of Captain Dewar's pages a heavier task than it otherwise would be. The track of the *Nyanza* was, roughly, as follows:—From Plymouth to the Azores, Cape Verd Islands, Rio Janeiro, the Falkland Islands, where the sailing-master was discharged and months were spent awaiting the arrival of his successor from England, through the Straits of Magellan, where the crew showed a decidedly mutinous spirit, to Juan Fernandez, Callao, Easter Island, the Marquesas, Tahiti, Samoa, Friendly and Fiji Islands, New Caledonia, New Hebrides, Sandwich Islands, San Francisco, Vancouver, the Ladrones, Japan, Kamchatka, and the Marshall Islands to Ponape, where the yacht was wrecked. In such a cruise there must, of course, have been many incidents worth recording, and places visited worth describing; and had Captain Dewar confined his narrative to such subjects, it would have been more interesting. As it is, the story is overlaid with trivial details which often render the reading wearisome. The author is a thorough sportsman, and his adventures when in pursuit of various kinds of game will be enjoyed by many readers, while his remarks on some of the less known Pacific islands have a distinct value. The illustrations, especially the smaller pictures in the text, have been carefully and artistically produced. The map is all that is required, and as to the general get-up of the book, it suffices to say that it bears all those marks of excellence for which Messrs. Blackwood's volumes are renowned.

Eine Erholungsfahrt nach Texas und Mexico. Tagebuchblätter von Joh. E. Rabe. Hamburg und Leipzig: Verlag von Leopold Voss, 1893. Pp. 284.

The author made a short tour in America in the autumn of 1890, and has recorded his experiences in this volume. It is written in a light, chatty style, and is full of details concerning the life and occupations of the people, railways, scenery, cattle-farming, and agriculture. The subjects are not treated comprehensively, but each observation is recorded as the traveller passes through the country. With Mexico Herr Rabe was particularly charmed, though in the few days he spent there he could only get a glimpse of the city of Mexico and make an excursion to Orizaba. He depicts the natives and their costume, and scenes on the street, in the market, and on the railway, with vividness and exactness; and the general reader may pass an hour or two pleasantly and profitably in the perusal of his narrative.

NEW MAPS.

WORLD.

BARTHOLOMEW'S ROUTE CHARTS: INDIA AND THE EAST. With twelve inset Maps.

An excellent map for the use of travellers to the East, showing the principal routes from Great Britain to India, China, Japan, and Australia. The steamer routes, distances in nautical miles and time in days, are given, together with numerous deep-sea soundings.

EUROPE.

DEUTSCH-SÜDWESTAFRIKANISCHEN SCHUTZGEBIETE, Karte der von Hptm. u. Lieut. von François gemachten Aufnahmen in dem ——. 1890. Massstab 1: 300,000. 2 Bl. *Mitt. von Forschungsreisenden und Gelehrten aus den deutschen Schutzgebieten, Bd* v. *Heft* 2.

PLAN OF WEST LONDON. *John Bartholomew, F.R.G.S.*

A very clear and useful map of this part of London, with railways, omnibus and tramway routes, and the boundaries of postal districts marked on it.

BARTHOLOMEW'S POCKET MAP OF EDINBURGH AND ITS SUBURBS, reduced from the Ordnance Survey.

A new and improved edition of a very handy map, with index in the margin to the principal streets, the railway stations, and the principal places of interest. A list of cab fares is also given.

AFRICA.

AFRIKA, Übersichtskarte zur Verbreitung der Zwergvölker in —— und Süd-Asien. Von Hellmuth Panckow.

Zeitschrift der Gesellschaft für Erdkunde zu Berlin, Band xxvii. *Blatt* 2. *Berlin: W. H. Kühl.*

SAHARA OCCIDENTAL. Itinéraire chez les Maures Trarza par Léon Fabert, 5 Sept.—30 Nov. 1891. Echelle, 1 : 1,100,000.

Bulletin de la Société de Géographie, 2e Trimestre, 1892.

CÔTE DE L'IVOIRE, pour la lecture du Journal de Voyage du Lieutenant Quiquerez d'après les croquis annexés au Journal. 1891. Echelle, 1 : 1,000,000. Lagune de Grand Lahou. Echelle, 1 : 500,000.

Bulletin de la Société de Géographie, 2e Trimestre, 1892.

TOGO-GEBIET, Dr. R. Büttner's Reisewege im ——, 1890-91. Massstab, 1 : 2,000,000. *Verhandlungen der Gesellschaft für Erdkunde zu Berlin, Band* xix. *Blatt* 1. *Berlin: W. H. Kühl.*

UGANDA. Parts of —— and neighbouring Countries, to illustrate the Explorations of Captain F. D. Lugard. 1891-92. By E. G. Ravenstein. *Scale,* 1 : 1,000,000. *Proceedings of the Royal Geographical Society, December* 1892.

VICTORIA- UND DES ALBERT-NJANSA. Provisorische Original-Routen-Skizze der Expedition Dr. Emin Pascha's im Westen des ——. Aufgenommen und entworfen von Dr. Franz Stuhlmann. Massstab, 1 : 1,000,000.

Petermann's Geogr. Mitteilungen, Jahrgang 1892, *Tafel* 16. *Gotha: Justus Perthes.*

TABORA NACH DEM VIKTORIA-NYANSA, Reise-Route von ——. Nach den Aufnahmen von Dr. Stuhlmann und P. Schynse, im Jahre 1890. Entworfen und gezeichnet von Dr. von Danckelmann. Massstab, 1 : 300,000.

Mittheilungen aus den deutschen Schutzgebieten, v. *Band*, *Heft* 3.

VIKTORIA-NYANSA, Das Südwest-Ende des ——. Nach den Aufnahmen von Dr. Stuhlmann in Verbindung mit der Darstellung von P. Schynse. Entworfen und gezeichnet von Dr. von Danckelmann. Massstab, 1 : 300,000.

Mittheilungen aus den deutschen Schutzgebieten, v. *Band*, *Heft* 3.

KARAGWE UND MPORORO, Expedition Dr. Emin Pascha. Vorläufige Routenskizze des Marsches durch ——. Aufgenommen und gezeichnet von Dr. F. Stuhlmann. Massstab, 1 : 500,000.

Mittheilungen aus den deutschen Schutzgebieten, v. *Band*, *Heft* 4.

BUKOBA, Skizze der Umgebung von ——. Construirt und gezeichnet von Dr. F. Stuhlmann. Aufgenommen April 1892. Massstab, 1 : 40,000.

Mittheilungen aus den deutschen Schutzgebieten, v. *Band*, *Heft* 4.

UMBA FLUSS, Der ——, nach den Aufnahmen von Dr. W. F. Erhardt. Unter Benutzung der Aufnahmen von Dr. O. Baumann. Massstab, 1 : 300,000.

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NYASSA, Karte der Berliner Missions Expedition im Norden des ——. Entworfen von A. Merensky, mit Zusätzen von Dr. B. Hassenstein. Massstab, 1 : 600,000. *Petermann's Geogr. Mitteilungen*, *Jahrgang* 1892, *Tafel* 19.

Gotha: Justus Perthes.

IMERINA, Central Madagascar, from Père Robiet's Maps, to illustrate Rev. J. Sibree's Paper. *Scale*, 1 : 1,000,000.

Proceedings of the Royal Geographical Society, *November* 1892.

SOUTH AMERICA.

ARAGUAYA-TOCANTINS, Karte des ——, von Leopoldina bis Pará. Nach neueren brasilianischen Aufnahmen und eigenen Beobachtungen von Dr. Paul Ehrenreich. Massstab, 1 : 1,000,000.

Zeitschrift der Gesellschaft für Erdkunde zu Berlin, *Band* xvii. Blatt 3.

Berlin: W. H. Kühl.

RIO PARANAPANEMA, Kartenskizze des ——. Massstab, 1 : 400,000. Meteorologische Stationen im Staate São Paulo. Massstab, 1 : 600,000. Von Prof. Dr. Henry Lange. *Petermann's Geogr. Mitteilungen*, *Jahrgang* 1892, *Tafel* 21.

Gotha: Justus Perthes.

CHART.

TOPOLOBAMPO HARBOR, Gulf of California. From a Survey in 1875 by the Officers of the U.S. s. *Narragansett*, Comdr. George Dewey, U.S.N., Comdg.

Hydrographic Office, Washington. Richardson Clover.
Lieut.-Commander, U.S.N., Hydrographer.

THE SCOTTISH
GEOGRAPHICAL
MAGAZINE.

IRRIGATION AND AGRICULTURE IN EGYPT.

By Colonel Justin C. Ross, R.E., C.M.G.,
Late Inspector-General of Irrigation in Egypt.

(*Read before the Society in Edinburgh and Glasgow, March* 1893.)

I come before you this evening to explain what irrigation has been in Egypt, and to point out what is the possible future for it. In describing irrigation, I shall attempt to explain the regimen of the Nile, and try to remove many erroneous ideas that have been widely disseminated of late by travellers and guide-books.

My special qualifications for lecturing to-night are that I have been from 1863 to 1883 employed in irrigation in the Gangetic plains, in the North-West Provinces of India, and in the end of 1883 went to Egypt to assist in rectifying the irrigation system there. In Egypt, after a year and a half's experience as Irrigation Inspector in charge of the Eastern Delta, I succeeded to the duties of Inspector-General of Irrigation, of all Egypt,—Colonel Scott Moncrieff, now Sir Colin Scott Moncrieff, who then held the post, becoming Under-Secretary of State for Public Works.

Geology of the Nile Valley.

The Nile is the one river of Egypt proper, and its water supplies the place of the rainfall in other countries in enabling man, by the use of the water in irrigation, to raise crops. Were irrigation to be suspended, all Egypt would remain brown and dry, and produce nothing, save some rank weeds, which would flourish during the winter from the winter's rains.

We have no exact data to show at what period the rainfall ceased in Egypt. Professor Hull has elaborated a theory that there was a "pluviôse" or rainy period about the time of the Glacial period here, but as this is founded on the visible erosion of the ravines bordering the Nile

valley, and not on visible traces of a luxuriant vegetation, the matter remains in doubt. The only traces of vegetation in the desert are the silicified tree-trunks which are so often visited by tourists from Cairo. These remains are found at other points in the desert west of the pyramids, and notably near the Salâmah oasis, about 125 miles south-west of Wadi Halfah. This ancient flora is considered to be of the Meiocene period, and has nothing to do with Hull's pluviose period. According to Schweinfurth, traces of marine deposits of the Pleiocene period are found in the western desert at a height of 65 mètres above the present level of the sea.

If there has been no local elevation of the Nile valley since that period, this points to the sea reaching up as far as Girgâ. But as all deltaic deposits at the mouths of rivers have a tendency by their ever-increasing weight to lower the land at the lower part of the Delta, it is more than probable that the same flexure raised the land irregularly higher up the continent, and we may have this Pleiocene deposit of shells raised in proportion.

Not much has been done in the way of deep borings, but what little has been done has shown a very startling series of changes. It was, till recently, thought that the limestone cliffs of the Tertiary period at Cairo represented the sea-front of an extensive sea denudation, and therefore it seemed reasonable to expect that borings conducted at Tanta and Zagazig would show the denuded rock at no great depth. Instead of this, a series of fine clays, gravels, and sands alternating with each other have been found down to a depth of 130 feet, or about 105 feet below the present sea-level, and then 215 feet of coarse pebbles, etc. The known borings made in this century (see Report on a series of specimens of the deposits of the Nile Delta, *Proceedings Royal Society*, No. 240, 1886, by J. W. Judd, F.R.S., Secy. Geol. Society) are as follows :—

1799 . .	French Engineer,	77½ feet	at	Asyût.
1850 (?) .	Linant Pasha,	72 ,,		apex of Delta.
1860 (*circa*)	M. Horner,	40-59 ,,		Delta and Memphis.
1884-1887	Royal Engineers,	45 ,,		Kafr el Zayât.
		73 ,,		Tanta.
		84 ,,		Zagazig.
1885 . .	Do.,	153 ,,		Rosetta. (Of this the lower 10 feet on gravel.)
1888 . .	Do.,	345 ,,		Zagazig. (At 121 feet gravels met with.)

Professor Hull supposes a period of great rainfall corresponding to the Glacial period. During this period the Mediterranean was a land-locked sea, and great migrations of large animals—elephants, hippopotami, etc.—took place over three isthmuses corresponding to Suez, Sicily-Tunis, and the Straits of Gibraltar. This, he says, would account for the erosion of valleys much below the present sea-level, as the Fayûm and other hollows, and at the same time allow the Nile to cut through the limestone floor of its valley to the depth shown by the Zagazig boring.

The next notable fact is that of a great submersion of the valley, so that we find the sea-beach at Cairo with borings of the *Pholas* up to a

level of 67 mètres above present sea-level. In the present valley this would give sea-water up to about Naga Hamâdi, 375 miles from Cairo up the Nile. It was during this submersion that the gravel and alluvial flats on the sides of the hills bordering the valley were laid down, and that the late marine deposits took place in the Fayûm.

After this the sea appears to have washed the foot of the cliffs at Cairo, at a level of + 22 m., for some time, for during this period there have been formed black deposits of Nile mud, the surfaces of which are practically parallel to the present flood surface, and which have been preserved at the mouths of ravines under a conglomeration of pebbles washed down the ravines, and in the Kom Ombo Lake. These deposits have not been noticed by the various well-known geologists who have visited Egypt. At Kena this deposit is immediately on a bed of pebbles washed across the Nile from the Kena Kus ravine. These pebble deposits are the only instance in which the rocks of the Red Sea ridge have been washed into and across the Nile. In all the other ravines the pebbles are of the ordinary cherts, marls, and limestones of the adjacent desert. The existence of Nile mud lying preserved on these pebbles, and of a similar Nile mud buried under local pebbles in other ravines at the same level relative to the present Nile, would show that the mud deposits were contemporaneous, and that there must have been great erosion in the Kena Kus ravine ; but this is evidently much later than Hull's pluvial period, and therefore we are driven to think that there must have been a second period of heavy rain. This imprisoned Nile mud is well seen at Akhmîm, Qâw, Sharawnah, near Isna, and at Tura. It also exists on the plain of Kom Ombo. It is so old that it has lime concretions in it. I have only met with it once under the present Nile deposit, near Kena, where a canal passed through it. The very high-level gravel beds do not contain black mud, but a yellow clay arising from the decomposed limestone and washings from the marl beds. The imprisoning of Nile mud is in full action at the present day : I myself have seen an area of more than one hundred feet in width imprisoned below pebbles which were swept out of a ravine at Kafr Disami and Es Saft, about 40 miles south of Cairo. It will be seen that the geology of Egypt in the most recent times, when man was in a savage state, is very perplexing, and the data we have obtained up to date are not sufficient to pronounce authoritatively regarding it. The recent borings at Zagazig and Rosetta show that down to 120-140 feet (40 mètres, say) successive layers of blown sand and Nile alluvium are found, and below that, gravelly deposits consisting of pebbles and subangular fragments exist for another 200 feet or so. The Zagazig boring has pierced these gravels to a depth of 96 mètres below sea-level.

It is somewhat rash to pronounce on one or two sections only, but when we find that the Mediterranean currents sweep all the clay of the present flood eastward, and that there is only a sandy foreshore to the Delta, I think we may assume that the above-mentioned gravels and alluvia were not laid down on a sea face, more especially as the sand, according to Professor Judd's microscopic examination, is wind-blown—*i.e.* the grains are round and polished ; sea sand is not round or polished. It seems

to me that the Delta was much more advanced than now, and that the Nile flowed through extensive hills of drifting sand.

The gravels would appear to support Professor Hull's theory of a shut-in Mediterranean Sea, as the river must have been a torrent descending a much steeper slope than now. Coming now to the present geological period, in which man entered Egypt as a civilised being, capable of undertaking public works for the benefit of the community, we must first examine the conditions of the flow of the Nile before he sought to control it. The great rivers of the world in the sub-tropical regions are characterised by floods which recur at stated times in the year: in other words, they are fed by Equatorial rainfalls which produce floods with great regularity, though they may vary in volume a little.

When these rivers have excavated their beds through the strata of the last geological period, they enter on what is termed a deltaic condition—that is, during long centuries the changes in the height of their floods and in their bed levels are very small. Each ordinary flood as it comes has a tendency to heap up on the river banks loam and sand deposits, but *not* clay. These loamy deposits gradually get so high that, unless there were a compensating arrangement, the river would flow in a hollow ridge of its own making, and the lands right and left would be submerged and probably remain as long marshes full of weeds. The local action of this deltaic ridge is most remarkably shown in the Delta of the Nile, where for at least 50 years the banks of the river have been strengthened by man, so that the whole flood must flow between them. The result of this is that between the two banks there are "Berms" (or, as the Arabs foolishly call them, *Gezâir*, or islands) which have been silted up, and are now 4 feet higher than the natural deltaic ridge. Before these banks were made the flood used to rise 4 feet less and disperse itself into the Delta basins.

The natural remedy for this is provided by the river itself—sooner or later a breach occurs in the deltaic ridge by the river cutting it away as it twists about. The water rushes into the lowlands, and by its velocity tears out a channel for itself. The velocity of the onward current in the main channel is slackened by the loss of water, and coarse sand from the bottom strata collects and forms a bar, thus forcing the river more and more into the diversion. The flood waters rejoin the original stream at some weak point further down, and eventually the original bed may be abandoned, and an immense bank of sand thrown up at the bifurcation. This is then gathered up by the wind, aided by coarse grass and tamarisk, and eventually for more than a mile you may have a sandy plain with drifting tumuli where the river flowed 10 years before. The rest of the deserted channel takes much longer to silt up. First, owing to the feebleness of the current passing through it, its central portion, though flooded by percolation, is at a lower level than the flood in the new channel, and several breaches occur at various points. These breaches project deposits of sand into the reedy channel, through which the descending water filters and comes out clear. Another sand bar is thrown up at the downstream junction with the new channel. In short, we have in this deserted channel three deposits :—

(1) Fine clay deposited in slowly running water, and in which grow water-weeds, turning it into a deep black-blue clay of extreme tenacity.

(2) Loams deposited by a faster-running current.

(3) Sands deposited by the breaches and inrushes of water in very high floods.

So when the river in the course of another century or so comes back and shaves away the old channel, you will see fine clear sand lying on hard clay, and again the same hard clay lying on loam or fine clean sand.

The whole of the Nile valley has without doubt been built up thus, and there is no place where the engineer opens the soil for deep foundations that he does not find these three deposits. Often he is delighted to find a stiff dry clay within 3 feet of the bottom of his foundations. Alas! 2 feet more excavation exposes a fine sand full of water, which gives him infinite trouble. And as often the case is reversed. He has been pumping hard day and night to keep down the water in a foundation pit, when lo! a clay band is reached, and all trouble is at an end. These deposits are not parallel to each other, nor are their thicknesses equal, nor are they necessarily inclined in the same way as the river slope. They are termed fluviatile deposits in geological text-books.

Even when man does not embank the river, confining it to a definite course, he builds towns on the edge, and the stone and hard material from them generally serve to check the river's vagaries, and restrict its changes within narrow limits of probably one mile or so.

We can see that the Romans, when they succeeded the Egyptian Kings, freely used the Temple walls to protect many important sites. They made long river groynes of cut stones from the neighbouring temples, on many of which are Ptolemaic hieroglyphics. I have not seen any Greek temple stones, and conclude therefore that this river-training ceased after the Roman Empire fell. The Mohammedans have done nothing. We have an instance of a Ptolemaic temple at Qâw holding out against the Nile attacks till 1823, when it was seen by an English traveller. It did not exist in 1844. The Roman wall of the Luxor temple has saved the temple during the last ten years, as it has probably done a dozen times since the temple was protected.

But in looking for traces of man in borings, we must be careful to avoid an old error made some time ago by scientific men, who imagined that if they could find in a delta a fragment of stone bearing marks of human work, they could get at the age of the work by calculating from the known rate of accumulation in the delta. The fact is that these great rivers in flood have a far more disturbing effect downwards than laterally. When a serious obstruction is met with, whether a natural bank of clay, or a rocky foreshore, or the ruin of a building, a hole is scooped out which can be three times the average depth of the river. Thus if we take the average depth of the Nile in flood to be 9 mètres, we can find holes 27 mètres deep. At Cairo, where the river has been forced into one channel, and flows past the Kasr en Nil Barracks and the old town of Bulâq, there is a scoured bed of which the level is minus 6 mètres, or 6 mètres below sea-level; and it is 26 mètres deep at flood-time. If we throw a soda-water bottle off the terrace of the barracks, it will lie quite

24 mètres below the present surface, and if by any great slipping of houses and the re-opening of the old channel to the west the Nile were to desert the present channel, this soda-water bottle might in 30 years be covered with 24 mètres of soil, and might be pronounced 24,000 years old !— the Delta rising at the rate of a mètre in 1000 years.

Ancient Irrigation.

We have no definite accounts of irrigation in Pharaonic times, as we have not yet found the mummy of an engineer who was so much attached to his science as to have his *aide mémoire* buried with him. But various inscriptions of provincial governors and of kings record the fact that canals were either well maintained or restored after times of disturbance. Thus in the 12th Dynasty we read in the cave tombs of Beni Hasan: "He determined the waters by what was in the list." This probably alludes to the times of opening the basins.

It cannot be expected that any traces of bridges or regulators should remain, for by their very use they get into a dangerous condition through erosion of the ground on the downstream side. This erosion sooner or later brings the bridge down, unless it is carefully repaired. Thus in times of war or internal troubles the peasantry would soon wreck a bridge by careless regulation. Once a bridge has gone, the ruins are rapidly broken up by the peasantry to mend their villages, and protect them from the waves of the floods. The only old bridge in Egypt is one carrying an old road over a large canal dug by a Jew in the 13th century A.D. The bridge was built in the 14th century, but is not a regulating bridge, and as the Jew's canal has silted up, the bridge stands on dry land, the arches being filled with soil.

Irrigation by Basins.

Up to 1830 the whole of Egypt was irrigated by the Pharaonic system of basins. This system is traditionally referred to the 1st King of Egypt, Mena (Greek Menes). We may suppose that he came into Egypt or conquered the whole of Egypt, and found the Nile in a very untrained state, liable to great floods and irregular movements. The first thing he would do would be to construct a series of banks reaching from the desert on one hand to the high deltaic ridge on the other. The conditions under which he would work must have been much the same as now, save that probably the deltaic ridge was more marked than now, and the people were all living on the ridge or on the desert. To avoid too great a difference of level, he would place his banks at such a distance apart that the difference between the horizontal planes of water would not be more than one mètre. As the slope of the country is $\frac{1}{10000}$, this would give a bank at every 10 kilomètres. At first he would, experimentally, have each basin fed by one or more canals direct from the Nile, and when a basin was brought up to Nile level, *i.e.* when the lower canal ceased to flow, it would be closed ; or, as often happens, if the Nile fell in the middle of the flood season, he would also close the canals to keep

the water in the basin. When the flood came to an end he would commence to let off the water. But as the canals filled the basins in about 35 days, and had by that time got much silted up, he would have to seek some other method of letting the water flow off. If he took as long to empty his basins as to fill them, he would find that the sowing season had passed, and that there was great risk of the wheat and barley crops being blighted by the hot winds in the end of March.

Considering these things, he would come to the conclusion that he must cut the basins one on to the other, commencing from the south, so that each basin might be brought up to full level for a few days to wet any piece that was dry, and at the end of each chain of basins determined by natural features he would cut the last basin into the Nile. This point would be where the Nile had come fairly near the desert or where a great branch took off.

In some years there would be breaches in the basin banks, and this would cause a great loss of water if the breach occurred when the Nile was falling, in the middle of September, for the whole series of basins of equal area would go, one after the other. To remedy as much as possible the evils of this, the King would see that the last basin of the series should be very much larger than any other, so as to act as a compensating reservoir which could hold a large quantity of water without breaking. This last or tail basin being big, its discharge would also so swell the river that its great mass of water could not pass rapidly into the Nile, as the river would be so swollen by the great inrush of the first waters that it would prevent the remainder of the water flowing out like a torrent. It must be remembered that the sowing of the land under this system is done by throwing the seed on the wet mud, which is soft to a depth of at least 6 inches. The peasants can only sow a certain amount daily. A sudden retreat of the water leaves too much exposed, the land rapidly hardens, and ploughing has to be resorted to. This is difficult, as under this system of agriculture plough oxen are not kept.

This system does not provide for the submersion of the high land near the Nile. In the old days, and I believe up to very recent times, the basin canals ran through the high lands, and the people, in an ordinary Nile, irrigated these lands by lift, sowing autumn crops called *Nabâri*, such as *sorghum*, maize and vegetables. If the Nile fell below good-flood point, they only lifted a little more, and in a high Nile they enjoyed unlimited water for washing the land, etc. In the Pharaonic times so good were the arrangements for clearances, and the *corvée* organisation was so perfect, that I think in the case of a low Nile the canals could be cleared out even during the flood, and the number of men on the lift machines indefinitely increased. From old maps, such as those of the French expedition, I have every reason to believe that this old system of straight delivery canals existed up to, certainly, 1830. There are numerous traces of old silt banks, where such masses of silt have accumulated that even in 50 years they have not been removed for manure. All these are straight delivery canals. There was a considerable failure of the Nile in 1790-1797, and it is not probable that anything was done to improve the canals. Again in 1835 to 1839 the floods were decidedly poor. The

French engineers had arrived in the country, and it is probable that after these years, when such activity was being displayed in the Delta, the canal in the high lands was made. It commenced from the head of the southern basin of a series and passed along the high lands, cutting all the small canals, and feeding them at a higher level than formerly. Also, probably, at this time there were some bridges built in the cross banks in the low lands to admit of the passage of water during the flood from one basin to another; and large canals for a series of low land basins were also made. In ancient times there had been low land canals, but they were really ancient arms of the Nile (and were treated as such), having longitudinal banks with basins and their own deltaic ridges.

The primitive arrangement worked fairly well, so long as there was no great pressure of population or foreign debt, and so long as the peasantry were semi-slaves or serfs. In a bad year, if one-third of the land was unsown in the Nile time, the other two-thirds produced well, and the part unsown could be extensively watered by hand from wells by serf labour.

But when the Khedives of Egypt came into the European market for cash, they found that the old style produced serious deficits in their treasuries, and they gradually began to construct works which should have the effect of utilising the floods throughout the valley.

It will be seen that Upper Egypt down to Asyût is divided naturally into series or chains of basins, which are divided from each other by gravel or rock spurs from the desert. If we have a quantity of water impounded in a series of basins in the end of September, we cannot utilise it if we have not a canal through the desert spur. And if we have no passage under the low land canals, we can only drop it into the low-level canal, even after the desert spur has been pierced by a canal. So that a syphon or ramped culvert under the low-level canal becomes necessary, and by it we are able to pass water at the end of the flood into the next northern high land canal, and from this it is but a step to convert the canal piercing the gravel ridge into the high land canal itself—*i.e.* to transfer its head south of the ridge.

After this we have to deepen all canals to allow of a Bad Nile passing a considerable volume down every canal.

I will here explain what is meant by a Bad, Good, or Flood Nile. The gauge at Aswân, called the Nilometer because its original function was to register the flood of the Nile, is carved on the rock. It was in use in the Ptolemaic period, and it is believed that its cubits are nearly the same as those now in use, which were cut by Mahmûd Pasha el Fellaky, a scientific Turco-Egyptian, who died about six years ago. The cubits now in use are 0·54 of a metre, and the floods of the Nile (or "the Nile," as the Arabs call the flood) varies between 13 cubits and 18 cubits. In a monument in Rome the Nile is represented as a man with sixteen small children climbing about him, showing that 16 cubits was thought a good Nile. At the present day it requires $16\frac{1}{4}$ cubits to irrigate by flow the greater part of the islands and high lands in the Nile valley, and $17\frac{1}{2}$ cubits flood everything; 17 to 18 cubits continuously for any

time, more especially if late in the season, after filling the basins, produces great pressure in the Delta, and the whole population turns out on the banks.

If, on the other hand, the Nile is between 14 and 15 cubits, there is no direct free flow in the high lands, and if it does not rise above 14 cubits, a most disastrous failure of supply takes place in the canals filling the basins.

The lowest Nile that we know of since 1737 was in the year 1877, when the Nile rose for a very short time over 13, and its average for thirty days of flood was only $12\frac{3}{4}$, cubits. The canals were at their worst, and quite out of order, and a real famine was the consequence. The result of that year overthrew Ismail Pasha, and therefore was a blessing in disguise to Egypt. In 1888 also there was a very low Nile, the average being $13\frac{19}{24}$ cubits. Over 250,000 acres were left dry in Upper Egypt, and the financial loss was very great.

In consequence of this bad year, Government resolved to set the canals in order by deepening and extending them, and building all the syphons necessary to ensure water being brought from a sufficient distance from the south to guarantee irrigation in a bad year. The banks were all provided with regulators, and all the necessary escapes were made into the Nile. These works have cost over £600,000, and were very nearly finished when I left Egypt in the summer of 1892. In an ordinary year the new works will ensure a far more equable distribution of the rich red water of the Nile, and thus maintain the whole soil in one uniform richness. The cost will easily be paid back in ten years, and the greater number of the structures will be capable of being utilised in the distant future when perennial irrigation is introduced into the high lands of Upper Egypt.

Summer Irrigation.

To introduce summer crops, such as sugar, cotton, or rice, we have only, in the first instance, to dig wells and lift up the water by machines. This method is suitable to cultivators who have small holdings, and who live in a self-supporting fashion. It is not economical, nor is there a maximum of produce for a minimum of labour expended. For semi-barbaric countries, liable to be upset by war and incursions of semi-savage enemies, it is excellent. There are still many tracts of Upper Egypt cultivated thus, and the well-water is practically inexhaustible, as the Nile-water is never more than 35 feet below the surface even in summer.

But to have summer cultivation on a large scale we must bring the water of the Nile to the surface, either by a canal or a low-grade slope taking off far up the Nile, or by pumping water by steam power up to the field level or into a large canal, or we must make a dam in the Nile to raise its summer level, so that the cost of excavating the canal may not be excessive. The Ibrâhîmîyah canal in Middle Egypt is an example of the first method. The pumps of Khatatbah and Atfah (in Arabic *Atf*), before they were superseded by the Barrage and the numerous pumping

machines in Upper Egypt and in the Delta, are examples of the second class. The Barrage at the apex of the Delta is an instance of the third class, and when we extend the summer cultivation (*Sêfi* in Arabic) to Upper Egypt there will be also barrages made for the high land canals.

When summer irrigation was introduced into the Nile valley of Middle Egypt it was only given to the high lands. The low lands are still under basin irrigation. The quality of the water delivered to these basins has been much poorer than it was before the Ibrâhîmîyah canal was dug, as a sufficient number of syphons was not made to pass the fresh water of the Nile under the canal.

The Delta canals have as their main lines various branches of the Nile of the greatest antiquity. On these old canals are situated towns founded in the ancient Empire, probably 3000 B.C., and on others many towns celebrated in the history of the time of Moses.

As long as the Delta remained under basin culture these canals were the supply canals, each on its deltaic ridge. They had deep drainage canals between each pair which carried off the basin water. These canals are called *Masraf* in Arabic. But when Muhammad Ali introduced summer or perennial cultivation, the canals of supply and the Nile had to be embanked, so that the floods might pass down without flooding the fields as before, the water being carried above soil to admit of free-flow irrigation.

Soon after the introduction of perennial irrigation, the village notables in council every year decreed new subsidiary canals, and by 1880 the length and discharging capacity of the distributary canals were about eight times that of the requirements of the land. Dams were made in all directions with the effect of infinitely increasing silt deposits.

The drainage canals (really meant for excess flood-water) were surcharged in the flood by the water in great excess in the numerous subsidiary canals, and the maintenance of their banks was most difficult. Their new function, that of drainage of the water used for soil-washing, was quite disregarded, and they finally became irrigation canals. In a short time they themselves made ridge deposits, and the lands lying near the drainage canal were ruined, as they were surrounded on all sides by high-level water even in summer, the original drainage canal being dammed up in reaches.

We have had the very greatest difficulty in disentangling this complicated series of canals and drains, and in many instances the vested rights have been too much for us, and the expense of making new drains far beyond our budget resources.

This state of affairs is worst in the Eastern Delta, and least in the Western Delta, where, up to 1885, water in summer was very scarce.

In concluding this sketch of irrigation I must give all praise to the legendary King Mena, who introduced the basin system. One never can find out what happened before the time of these extraordinary men whose antiquity is such that all chronologies are modern compared with theirs. They appear before us as masters of engineering, mathematics, agriculture, civil government, and organisation of masses of men on

works, whether in the desert or near their strip of fertile land. We now know by the cumulative results of human experience that the only way to keep a deltaic river from being a source of great and frequently recurring calamity is to adopt the basin system of King Mena. As the alluvial deposit rises on the ridge near the river, so does it rise in the low lands off the river, and all through Upper Egypt the highest flood is only 8 to 9 feet deep in the low lands. In Italy the Po is often 24 feet to 36 feet above the land.

In China we read of the horrors of the Yangtse Kiang inundations, where photographs show us breaches in the river and the *bed* of the main stream exposed to view quite dry, the water having rushed out to the side.

America, even from the 200 years of occupation by civilised man, is now beginning to awake to the possibility of the most awful inundations by the Mississippi deserting its course, and a very serious report has been addressed to Congress on this subject.

But the mystery remains, "Where did King Mena get *his* experience?"

Salt in the Soil and its Cure.

The great bugbear of the Egyptian cultivator is the ever-increasing quantity of salt in the soil. Many tourists, even of a scientific type, who travel in Egypt, say without thinking—"Salt! why of course there must be large quantities of salt in the soil of Egypt, as it emerged from the sea in a recent geological period, and all Egypt has been won back from the sea by the Nile depositing its mud in the sea." This error is much more common than one would think in the writings of scientific travellers on the Nile and Euphrates valley.

1. The facts are, that the Nile delta and the Nile valley were not laid down in the sea; that is to say, the surface cultivated near Cairo to-day consists of mud and sand laid down by fresh-water deposits to a depth of at least 50 feet—exactly similar to that laid down at Asyût or Isna, hundreds of miles up the valley.

2. If the sand and gravel, washed and arranged by the sea when it was 40 feet above the present Cairo surface, and which are composed of the detritus of the Eocene cliffs overlooking Cairo, etc., were salt when the sea finally retired from them, they have been practically cleaned of their salt by the heavy, though infrequent, rains forcing the salt down to low levels by percolation. In fact, all soils, whether clays, sands, or gravels, that have emerged from the sea in quite recent periods, are not salt, and it may be laid down generally that, unless we have evaporation greater than the rainfall, we shall not have salt deposits, even in a district that has been recently under the sea. The only exception to this is found in sea-shore lagoons, where there is great solar evaporation going on, and the loss is made up by the sea at each tide.

The analysis of the Blue and White Niles taken at Khartum shows the main source of the salt in the Egyptian water. We find from an analysis taken between 1875 and 1878 that the following were the number of grammes of salt in one cubic mètre of water during summer and at the

flood. That is to say, the water passing Khartum was taken at the lowest and flood seasons, and this water would pass Cairo in June and August :—

	Summer. Grammes.	Flood. Grammes.	
White Nile . .	40	130	in one cubic mètre of water.
Blue Nile . . .	21	153	Do.

The other great source of salt in the Nile is from the rains in the desert which fall with great irregularity from December to April on the desert surface, where it is denuded by the wind and the original rocks of the Tertiary and Secondary formations are disintegrated by the action of alternate heat and cold. There is a very considerable amount of salt in veins in these marls and limestones, which weathers out on the surface, often disclosing small pockets of salt. When one of the cyclone-like rain-bursts falls, the surface is scoured and a large quantity of water runs down the Nile, carrying fine mud highly charged with salt. This goes into the Nile direct, or spreads out in the adjacent fields and sinks in, leaving much of its salt in the upper soil. But this is only a local torrent, and occurs only in winter and spring. Part of this rainfall sinks into the desert and comes out in the subsoil of the basin, sometimes as brackish springs. But these springs are often quite sweet, so that this source of salt is not a very constant one. It does, however, have its effect; for the summer low water is undoubtedly fed by these springs, and the proportion of salt in summer at Cairo rises considerably, and is in June double that in August.

It must be noticed that the waters of the White Nile pass through the marsh of the ninth degree of latitude. In the hot weather the evaporation from the marshes must be enormous, and though we have no satisfactory analysis of the Nile water at Fashoda to compare with that of Gondokoro, we can safely assume that the water issuing from the marsh must be more salt than at Fashoda. Also, on the long course of the Nile between Khartum and Cairo (a distance of 2740 kilomètres or about 1700 miles), the evaporation is at the rate of at least 11 mm. a day. The time taken to flow from Khartum to Cairo is at least 60 days, and thus we have an evaporation of nearly $\frac{3}{4}$ of a mètre from the water surface. Taking it in another light we find that the daily loss is about 7 millions of cubic mètres, or not less than 1-6th of the supply. All this evaporation concentrates the water and makes the dissolved matter larger in proportion. When the water impregnated with this very considerable amount of salt is used for irrigation in summer, it is customary to use water every 20 days for cotton and every 15 days for sugar cane. Taking the cotton watering to commence on March 15th, and to go on to August 15th, we have in these 5 months, or 154 days, probably 8 waterings, at least 6 of which are from the heavily charged summer water. Part of this sinks into the subsoil to a point below the sun's action, but a very large part of it either evaporates from the surface or is held in the subsoil and thence evaporated by the sun. I have myself seen this in an irrigated field when a well was being dug. A distinct band

of hard, dry earth intervened between the damp surface soil and the lower soil into which the subsoil water was drawn up by capillary attraction. The result of this constant evaporation in the upper soil is that the first 3 feet of the soil get very salt, until they are cleaned by the processes to be described further on. When the soil is thus charged with salt, it loses its natural tendency to crack when dry, and then there is less heat admitted into the soil to carry on the chemical processes of "Nature's decay;" and eventually we come to a point where the soil does not crack at all, and the humus is quite destroyed, the land being rendered barren beyond recovery. When the soil is in this state the beautiful sepia-coloured clay of Egypt is changed into a chocolate-coloured powder, which is blown away by the wind and deposited on neighbouring fields, which are not much injured by it.

M. Matthey, a French chemist, has shown in the Egyptian Institute *Proceedings* that freshly deposited Nile soil contains only a trace of salt; but after 6 years of agriculture the salt appears as 0·332 per cent., or 3 parts in a thousand, notwithstanding the ordinary processes of washing incidental to agriculture.

Of the existence of this salt there can be no doubt even to a passing observer. The ridges in the cotton fields after irrigation have often an appearance of hoar frost, and the Cairo streets, watered copiously twice a day show the salt crystals glittering in the sunlight. You will see from the above details that the Egyptian farmer has not only to face the ordinary deterioration of soil by exhaustive cropping, but has to fear his land getting too salt for agriculture. The *felláh* (peasant) knows the remedy from childhood, and when he sees the land getting salt he says his land is sick (*ayyánah*), and knows the remedy well—*Plenty of fresh water.* Alas, in many cases this is not obtainable, and in other cases he has nowhere to throw away the salt-laden water after use. In the high lands on the edge of the river in the Nile valley he cannot always command fresh water, for the land is high and the water in the canals is often expended in basin irrigation, and he has to lift it with his *shadûf*, or bucket at the end of a long pole. So, in an ordinary flood, he has to irrigate by the slow *shadûf*, and he cannot throw up water quickly enough to cause a large amount of water to pass down into the subsoil carrying the upper salt with it. So he only makes matters worse. In the Delta, owing to the height of the flood-water above the soil, the farmer can generally command, during the flood, a sufficiency of water, but after he has put it on his land and it has absorbed the salt in the upper or cultivated crust, he cannot discharge the contaminated water on to his neighbours' fields nor into the canal, so he has either to let the water lie on the land and sink into the soil, carrying with it the salt to a level below the cultivated crust, or he tries to find a public drain into which he can discharge the water. This is often not accessible, and then he has to try and join with his neighbours in making a private drain into the nearest public drain, or he and his neighbours return their dirty water into the canal, an act punishable under the new Canal Act.

Now, the Delta, as you know, descends to the sea at a very gentle slope, and the water of both irrigation and washing flows down

towards the sea very slowly, commencing at a depth of about 5 mètres below the soil. So long as this water is more than 1 mètre below the surface no harm results. But when, owing to the nearness of the sea or of the great lakes, the water cannot sink any further, it rises close enough to the surface to be evaporated by the sun. A great stratum of salt soil is the result, and irrigation, especially from high-level canals, only brings it up more and more. The soil then loses its power of cracking, and in winter shows a vast sheet of white powdery crust, and in many cases is irretrievably ruined.

The irrigation of rainless countries is not studied much in Europe, nor does our Indian experience throw much light on the subject, as our Indian plains are visited by very heavy rain once a year, which washes away the salt. In America, however, we have rainless regions which have been irrigated for the last thirty years, and the scientific agriculturist has had some experience. The literature on this subject is increasing, and many remarkable facts are being discovered. The Professor of Agriculture in the University of California, Mr. E. W. Hilgard, has written, in 1890, some very interesting accounts of experiments in this direction, and has collected a large amount of facts about alkali lands. These lands are afflicted not only with salt as in Egypt, but with carbonate of soda, which is much more difficult to get rid of. Professor Wallace of the Edinburgh University has these pamphlets.

The question of providing drains at a lower level than the surface of the soil is forced on the Government as a work of general utility, since village communities cannot combine sufficiently to dig and maintain the large side and main drains.

The process of drainage in Egypt is nothing like what is understood by drainage in Scotland. Here we lay down pipes or loose stone drains in the subsoil, so that the rain water may not lie stagnating on the fields. But in Egypt, where, properly arranged, the drainage system is the exact converse of a canal system, a drainage channel is a wide canal dug in the soil of a width varying from 4 to 15 metres (13 to 49 feet). As we have main canals of supply, distributary canals, and minor distributaries, we have also minor drains discharging into large side drains, which discharge into the main drains. These last discharge into the great lakes in the Delta, and in Upper and Middle Egypt into the Nile when it is low, and into the adjacent basins when the Nile is high.

The Egyptian Government, between 1850 and 1883, allowed matters to drift sadly as regards upkeep of drains. In Middle Egypt it did nothing, and the sugarcane lands on the Ibrâhîmîyah canal in 20 years became seriously deteriorated by salt, more especially the lands lying next the basins where the lands lay lower than the level of the water in the adjacent basin. These fields, however, received at the same time, much of the washings from the higher fields nearer to the river. The great boundary drain (the Muhêt) was choked up with weeds, and was even used as an irrigating channel at many points.

Again, in Lower Egypt, though the upper part of the Delta between the level of + 18 M and + 6 M was naturally kept in good heart by the process of washing into the subsoil, the whole of the rest of the land

was deprived of drainage facilities by the practical abandonment of the large trench drains, which were either choked up with weeds or dammed up by fishermen who were in collusion with the local engineer. And on the slightest failure of canal supply the people used to irrigate from the drains, using the water which had done its duty once at a higher level in cleaning the rice fields. Nay, more, they had erected permanent machines (*Sâqiyah*) which brought with them rights and vested interests, and, when we came to set the drains in order, they wanted compensation and even threatened civil action against Government for disturbance. Many properties lying near the drains deteriorated very rapidly, though their land level was as high as 4 mètres above the lakes. The drains were so much choked up by weeds and fishers' dams that the water in them used to stand above the soil, and banks had to be made along the drains to keep the water from drowning the crops! If the drains had been clear there would have been a fall of at least 1 mètre into them.

In 1884 and 1885, before we obtained money for repairs of drains and canals, the *corvée* (or forced labour) could not overtake the task of drain-clearance after the canals had been cleared. The village agricultural councils of course voted the canal clearance first. The methods of washing the soil are three in number, exclusive of the great basin system in force in Upper Egypt.

First, By flooding the fields to a depth of 6 to 9 inches by a general flush of water, and then letting the water partly sink into the soil and partly go back to the Nile or canal. This is generally done at the end of the flood, when there is great command of water and the whole country is flooded, but many landowners practise it with small quantities of water, trusting entirely to the absorption into the soil.

The *second* method is by washing the fields with a large amount of water, let on continuously for 10 to 14 days, and discharged constantly at the lower end of the enclosure made to contain the water.

These enclosures embrace many fields and have banks of such a height that about 1 foot of water will lie on the surface of the ground. This method is generally adopted during Nile flood, as the water, rich in fertilising mud, is run on and the mud settles down on the field in a film. In Middle Egypt, however, it must be practised in the winter, as there is no proper outlet for drainage water when the Nile is high. The operation is termed *colmatage* in French and "warping" in English. The enclosures are most economically made to embrace 1000 acres, but these large operations require much plant, and therefore the enclosures (termed *Hoshah* in Arabic) are more often 200 to 250 acres in extent. This method can only be practised when there is a large drain close at hand, and where the canal system is more than sufficient for the ordinary irrigation of the surrounding estates.

The *third* method is by a close reticulation of small drains running into a larger drain parallel to the canal supplying the water. The parallel drain is 150 mètres from the canal, and the cross drains are 50 mètres apart. The ground is thus cut up into little blocks of 150 by 50 mètres, or about $1\frac{1}{2}$ acres each plot. This is the size adopted by the Abukîr Drainage Company. Other landed proprietors make smaller ones, even

to half an acre. Generally speaking the filtration system is used, no surface water being turned into the drains. Owing to the instability of the banks of salt soil, a depth of 6 inches is the safest to use over the fields.

According to the Abukîr Company's engineer, the cost is about £1, 10s. per acre for the year's washing. The second year's operations cost also £1, 10s., so that an acre of land which is not absolutely salt-stricken may be reclaimed for £3. (See note at the end of this paper, giving statistics of this Company's arrangements.)

The Fayûm.

The Fayûm is a depression apart from the Nile valley. It is shut in on all sides by the desert, save one narrow passage through the hills bordering the Nile valley. It slopes gradually away from the east, or Nile, side, and terminates in a wide shallow lake with an area of about 78 square miles.

The lake water is brackish and undrinkable, but the fish are of the fresh-water type. Though the Fayûm is always talked of as a depression, it does not appear such to a casual observer. The water of the lake, the Birket el Qurân, is now 42 mètres below sea-level and about 68 mètres below the Nile in flood. The surrounding low hills and desert are, however, sufficient to render the climate more equable than that of the Nile valley and Delta, affording protection from the high winds of the one and the fogs and cloudy weather of the other.

The fig and grape grow well in the Fayûm, and have a good flavour.

Where the soil is deep and well washed, the yield is good, and there appears to be less risk of worm in the cotton and of rust, etc., in the cereals. The *sorghum*, or large millet, grows very well, and I have myself measured it $14\frac{3}{4}$ feet high.

But unfortunately the black soil of the Fayûm is not deep, save where the old Nile deposits have settled on the flat portions; and the supply of water is decidedly brackish, as it comes from the Bahr Yûsif—originally, no doubt, a depression carrying off the Nile floods under the western hills, and which has, since the creation of the basin system, been employed as a basin feeder and a basin drain. The land between the Nile and the Bahr Yûsif drains into the latter when it is not in flood, and the percolation water of the basins returns from the hill side throughout the year. Even before the opening of the Ibrâhîmîyah canal, the Bahr Yûsif was a perennial stream fed by this drainage water and must have been very brackish indeed. About 250,000 cubic mètres *per diem* are obtained from this source at present. This natural supply is not capable of irrigating more than one-fifth of the cultivated area in summer. The Ibrâhîmîyah canal furnishes the remainder of the summer supply at the head of the Bahr Yûsif at Dêrût.

Before 1865, when there was no Ibrâhîmîyah canal, the people in the Fayûm used to collect water in small reservoirs called *Khazzân*. These reservoirs held up at their lower end about 20 feet of water. In the winter they were partially emptied by a sluice and the higher parts

were cultivated, and at the end of winter they were filled up again. Some of the more important ones were filled in September and retained full during the winter. As the Fayûm has no wells in it, the importance of these reservoirs must have been very great. The last one was abandoned in 1885 and its cultivable area sold.

On the eastern edge of the Birket el Qurûn there is a wide flat foreshore—the result of many centuries of erosion from the lands by the irrigation canals, etc. Owing to the large amount of waste water from the Bahr Yûsif and to the existence of an old basin, called the Hod et Tuyûr, the level of the lake rose at least 17 feet between 1870 and 1883, and about 10,000 acres of cultivable land were submerged. The measures adopted to remedy this state of affairs were to abolish the basin irrigation of the Hod et Tuyûr, making it *sêfi*—that is, cultivating cotton, etc., in summer, and secondly, to prevent an undue amount of water passing into the Fayûm at seasons when it was only required for the corn mills in the ravines. These measures have been very successful; the lake has been lowered $3\frac{1}{2}$ mètres since 1885, and cultivation has begun on the submerged flat, though not so rapidly as could be desired, owing to a lack of summer water, which renders rice cultivation impracticable.

The water that reaches the Fayûm in flood-time is not so red—*i.e.* highly charged with deposits—as the Nile itself, but still a very large amount of good mud is put on the Fayûm fields, and there is not so much sand in the soil on the banks of the Bahr Yûsif.

The salt, however, is greatly in excess of that in the Delta, notwithstanding the very great facilities for washing enjoyed by the Fayûm cultivators. I think the reason is that they have a dread of surface washing, as they lose an appreciable amount of soil on each occasion owing to their carelessly discharging the water down the steep slopes of the Fayûm. And again, washing by percolation is not so advantageous as in the Delta, for in many places the rock is found at 4 feet below the surface, and in other places a hard impermeable pan of marl occurs.

I have not in this lecture made any reference to the most interesting of all questions, the antiquities of Egypt, as there would be no time to do so; but in the case of the Fayûm I will make an exception, for its great archæological interest turns on an irrigation work, and the irrigation engineer until quite recently has not been consulted by the archæologists, who as a rule are not engineers, and have in the last forty years been grievously misled by the only engineer whom they did consult, viz., Linant de Bellefonds Pasha.

The great problem of ancient irrigation is, Where was Lake Mœris? We are told by Herodotus, B.C. 450, and Strabo and Diodorus, B.C. 25, that the Lake Mœris was a great sea-lake sheet of water between the Nomes of Arsinoë and Memphis. Into this lake the Nile ran during and after the flood, and when the river had sunk, the waters of Lake Mœris returned gradually to the Nile and thus maintained a good summer supply at Memphis and in the seven branches of the Nile.

Now, a line joining Memphis and the Medinet el Fayûm (Arsinoë) passes through the northern half of the Fayûm, and traces of a bank and colossal statues are in existence at the present day. Herodotus says the

Labyrinth, or great temple, was on the shore of Lake Mœris, and he also saw "in" the water (or more probably across the water flooding the fields of the dry part of the Fayûm) the two pyramids with colossal statues on them. The water of the lake would be seen at the back of these statues stretching to the distant horizon.

Dr. Petrie had the good fortune to find the nose of one of the statues in the ruins of their pedestals, and a figure of one of the Nomes, or provinces, into which Egypt was divided. He also dug down on the side of the Labyrinth, and found that the great temple was now represented by 7 feet and more of chips, made by the masons of Roman and Ptolemaic times when they broke up the Labyrinth to beautify the temple at Arsinoë, which was embellished and restored by Ptolemy Philadelphos in honour of his sister-wife Arsinoë. There are many traces of the founder of the temple and Labyrinth, the great Twelfth Dynasty King, Amenemha III., whose hieratic name is Maat-en-Ra. Herodotus appears to have listened to his dragoman as credulously as the present race of tourists, when he told him the lake was dug out by a king called Mœris in the time of the twelve kings of Egypt, about 250 years before. This was a time of great national decay and intestinal trouble, and therefore very unlikely to be one in which so great a public work could have been executed. We now know from inscriptions that Amenemha built a city and temple at Shad (the Arsinoë of Ptolemy), and if he did not actually commence the reclamation he perfected it. We also find from the sarcophagus of a high official buried close to the Labyrinth in Ptolemaic times that he bore the titles of overseer of the gate of the great lake and overseer of the cutting of the mouth or head of the lake.

The province in ancient times was called Tâ-sha, the land of the lake; and in Coptic times πιομ, the sea, from which the word Fayûm is derived. The word Mœris is a Greek form of Mar-ur, softened by Egyptian speech into Mi-ur, the great reservoir.

The Egyptological world, between the time of Lepsius in 1844 and that of Mariette in 1860-76, imagined that Lake Mœris was a small, high-level, shallow reservoir made out of the upper part of the Fayûm. This basin was supposed by Linant Pasha, the great consulting engineer of Muhammad Ali and his successors, to be fed by a high-level desert canal starting from near the town of Asyût. The water was thus about 20 feet above the Nile valley, and was let off into the river by sluice gates. Linant Pasha supposed the existing bank of Edwah and the wall of Minya el Hêt to be boundaries of this lake, as his levels showed their present height to be sufficient for this purpose. Thus the remainder of the Fayûm was cultivated. Recent levels have shown Linant Pasha's levelling to be 38 feet out (11·8 mètres), and it is, of course, an impossibility that the Fayûm land should be higher than the Nile valley, as the Nile valley was first deposited, and then the Fayûm.

Recent levels have shown that the old bank, the site of the colossi at Biahmu, the original soil of the temple of Arsinoë, and the marks across the lake on the west face are all about 22 mètres above sea-level, and though the southern bank has been probably levelled (having been made with earth and not sand as the northern bank), we can suppose that the circuit of bank was closed parallel to the Bahr Yûsif.

We can thus suppose without any difficulty the greater part of the Fayûm flooded to 22 mètres above sea-level, and as its shores would be the desert, we can see what Strabo means by saying that the shores are similar to sea-beaches—*i.e.* sandy.

To show how discontented Egyptologists were with Linant's small Lake Mœris, I quote from the translation of M. Maspéro by Miss Edwards. M. Maspéro is so worried by the defects in Linant's solution that he says:—"Recent explorations have proved that the dykes by which this pretended reservoir was bounded are modern works created probably within the last 200 years. *I no longer believe that Lake Mœris ever existed.*"

But M. Maspéro, through the whole of the thirtieth page of his *Egyptian Archæology*, shows himself very badly informed about existing irrigation in Egypt. This shows how a man can live ten years in the country and travel all over it many times, without becoming acquainted with the facts of irrigation, if he is not an agriculturist or an engineer. Brugsch Pasha, the great modern German Egyptologist, as recently as April 1892, declared in a paper read before the Egyptian Institute—"Dépuis Linant et Lepsius aucun savant sérieux du nombre des géographes et des Egyptologues ne s'est opposé à l'opinion émise par ces deux illustres auteurs," thus sustaining the Linant theory in the teeth of the facts known to Schweinfurth and Petrie, both *savants sérieux*.

Those who wish to thoroughly get up the facts and data collected in the last eight years, should consult *The Fayûm and Lake Mœris*, by Major Brown, R.E. (Edward Stanford, Charing Cross.) In this well-got-up little work they will find much to interest them and set them thinking.

As to tourists visiting the Fayûm, I regret to say that modern progress has halted there somewhat; with the exception of a few roads made in the last three years, and a branch railway taken out from the old central line, no progress in civilisation or in providing necessaries and comforts for travellers has been effected. Save one small Greek hotel in the chief town of the Fayûm, there is no accommodation whatever for a stranger.

When one takes into consideration the great range of temperature at Cairo (and its smells!), and the chilly winds of the Helwân desert, and the very short winter season at Luxor, one is struck by the possible future of the Fayûm as a really quiet, healthy resort. If a hotel were established on the low-level plateau about 30 feet above the lake, and a few rowing and sailing boats put on the lake, I feel sure a delicate person would enjoy the long quiet winter of the Fayûm, and avoid the noise and smells of Cairo, etc. The Copts of this out-of-the-way region would be an interesting study, and to others of a scientific turn of mind the archæology and geology would be interesting, but, above all, the delicate ones would have quiet and delicious air.

Reservoirs and Water Storage.

Although in 1884 much water ran to the sea in summer, it was soon found that, after we had raised the Barrage and given a largely increased summer supply to the eastern and central provinces, the people were

not slow in availing themselves of the privilege. In fact, owing to the fall of one-third in the price of cereals, the Egyptian cultivator soon saw that, if he was to pay his rent at all, it must be by cotton. I regret to say that the statistics of the years 1873 to 1883 are most deficient, save in the amount of cotton actually exported. But it is a matter of common notoriety that the yield per acre previous to 1880 was as much as 40 per cent. more than now, save where agriculture had been most carefully carried on ; and if we take into consideration the large increase of vegetable cultivation among the peasantry, we find that the summer cultivation of the Delta must have increased in area by at least one-third. People, certainly, do not use more water on a field than in the old days. It used to be a quite common rule to irrigate every 10 or 12 days. Now, with the rotations of water delivery, they cannot well give more than one watering in 20 days. The scarcity of water began to be felt in 1885 and in that year we had to throw an earthen dam across the mouth of the Rosetta branch in order to prevent the salt water coming up to the Atfah pumps, which supplied Alexandria. In 1886 the supply passing into the Damietta branch was so small, owing to the greatly increased discharges of the central Delta canal and of the canals for the eastern Delta near Cairo, that a rough stone dam was thrown across the Damietta branch in summer to feed the Bahr Mues, which irrigates down to and past Zagazig, and the next year another dam was thrown across the river below Mit Ghamr to raise the supply in the canal feeding the Bahr Saghîr and the riparian canal to Damietta. This diminution of supply brought the salt water up to Damietta, and we had to dam the river at the Damietta mouth with earth. In 1890, when the Barrage repairs were practically completed, and the new Rayyâh Taufîqi, or eastern riparian canal, had been opened, there was no need of any dam at the mouth of the Damietta branch, and it was not made in the summer of 1890. Owing, however, to the differences of levels in the newly enlarged riparian canals, on both banks there was great irregularity of delivery of water, and, in some cases, the owners of engines on the Nile itself had to take to their engines, and for a few weeks they threw water so salt that the cultivation sickened. Since then, great efforts have been made to force the water down to the furthest limit of cultivation ; and, though they have been successful, the proprietors of the numerous large stationary engines on the Nile banks look back with regret to the time when *they* had as much water as they liked to pump, and the rest of the water, now used with great effect, used to flow out to sea, and keep the salt water away from their doors.

We have now arrived at a stage in the summer irrigation of Egypt where the available natural supply has been completely exhausted, and there still remains more land to grow cotton, irrespective of the vast areas in the northern parts that stand in need of amelioration by a fairly cheap process. The Nile flood rice (called *Sabâini* from its ripening in 70 days) is now no longer remunerative, and thus amelioration can only be done cheaply by growing summer rice. For this there is no water whatever available. Every year sees more and more cotton sown, and, save in localities favoured with very large water-supply, rice steadily

diminishes. The sanitary authorities also complain that the water in summer gets more stagnant than before, owing to the great ponding up above the Barrage. The desert reclamations also want water, and, in addition to this, there is a growing desire to extend sugarcane cultivation in Upper Egypt; so that, at least, it may be put under the same *régime* as Middle Egypt in summer. There are also very good desert reclamations to be effected in the Fayûm. All these demands for increased summer irrigation point to the necessity of increasing by artificial means the water-supply. Now, you are familiar with the means of getting a water-supply for towns in this country. Your engineers throw dams across valleys in the mountainous regions, and submerge the land which is not valuable, and sometimes even submerge villages. The rain fills the reservoirs, and the small quantity of water necessary for a town is obtained with some difficulty, often by several reservoirs. For the Nile it is different.

The discharge required to improve the irrigation of Egypt is at least 20 millions of cubic mètres a day, and this amount of water is quite inconceivable by any European standard. It is equal to a quarter more than the discharge of the Ganges canal, familiar to many of you who have been in India.

This water can be got in only three ways:—

(1) By damming up the great Equatorial lakes, and letting their surplus water down in time to reach Egypt through May, June, and July.

(2) By damming the Nile itself in favourable places where the country is desert, and, therefore, where no great damage can be done to existing rights.

(3) By filling in flood-time any great desert depression, and then letting the water back to the Nile in summer.

The first plan, that of impounding water in the great lakes Victoria and Albert Nyanza on the Equator is too large a subject to consider in any great detail. The area of Victoria Nyanza is 65,000 square kilomètres, or 65,000 million square mètres. A raising or a depression of the level by one mètre would give a discharge of fully 30 times more than is wanted at Cairo, and to raise the lake one mètre would require the whole of an ordinary Nile flood for 65 days!

The Albert Nyanza, with its western catchment basin, might also furnish something. To take this enormous quantity of water off the flood-supply by impounding it in the rainy months on the Equator would most seriously reduce the Nile flood-discharge at Aswân, and would convert a fair flood into a bad one. This difficulty would have to be faced by using all the Nile valley barrages, which, as will be seen further on, are necessary for the distribution of a summer supply in the Nile valley.

The second method of impounding water in the Nile valley is by damming up the river itself at the points where the granite reefs cross the Nile, and where there either are, or were, cataracts. In this category is included Gebel Silsilal, where the river flows through a hill of sandstone of good quality.

By erecting great dams to receive the water, 60 feet high or more, we

could produce a lake with a length of at least 120 miles, and a depth, assuming the low Nile to be 6 feet deep, of 66 feet at the north end and 6 feet at the south end. Above Aswân this raising of the water would not drown much land. And at Gebel es Silsilah there is an old lake, now dry, and about 20 feet above water-level, which, if flooded to a depth of 5 mètres (16 feet), would have an area of about 30,000 acres.

The possible granite sites for this great dam are Aswân, Kalabshah, the second cataract, and the head of a long series of small rapids—a place called Dâl.

There has been much contention on this point. About twenty years ago a Society was founded called *Société d'Etudes du Nil*. It sent out men to study the river and to find out where, in ancient times, there was cultivation where the river never rises now. Although there was an immense amount of romantic writing and exaggerated deductions from actual observations, the Society produced a real project for throwing a dam across the river at Gebel es Silsilah. This project was seriously worked out by an able engineer, M. Jacquet, of high professional standing in France. The remainder of the proposals were brought out by a Dr. de la Motte, of no experience as an engineer, and cannot be looked on as a serious project. The project of M. Jacquet was estimated to cost 4 millions sterling.

Again, M. Prompt, the French member of the Board of Railways, in 1889-90 brought out a series of proposals to make the Nile navigable to Khartum by erecting dams of a moderate height at all the cataracts As these dams would not have any under-sluices, the only thing likely to fail would be the locks for navigation cut round their flanks. M. Prompt also incidentally stated that though the navigation works would not pay in tolls, still the impounding of about 1500 millions of cubic mètres of water would be so valuable to Egypt that the Government could put on a summer water-tax, and so recoup itself.

The English engineers in the Egyptian service pointed out, however, that the ponded reaches of the river would rapidly fill up with deposit, which at the same time would be temporarily taken away from the present irrigated area. And, after the reaches had filled up, the retaining capacity of the reservoirs above the dams would cease, and things would be no better than now.

The public interest was, however, so strongly roused by the scheme of reservoirs, that the Government found it necessary to depute an engineer to make actual surveys of the possible sites, and to examine whether the large areas of Dr. de la Motte were at the levels he alleged them to be.

This engineer, Mr. Willcocks, one of the inspectors of irrigation, aided by a small staff, took levels and made surveys. The results of the first year were that the Kom Ombo plain, or dried lake, was smaller than estimated by Dr. de la Motte; also that the Aswân cataract was very favourable from an engineering point of view; also that Kalabshah, though its granite was not so hard as that of Aswân, was a practicable site. Lastly, that the plain of Dakkah belonged to a quite different series of depressions, and had no connection with the ancient Nile deposits, as it was not less than 400 feet above the Nile.

Unfortunately Mr. Willcocks became possessed of a desire to flood the beautiful Temple of Philæ, and went out of his way to make absurd proposals to sell it to the Americans. The indignation of the scientific and artistic world was loudly expressed, and I think now, as I then said in my note on Mr. Willcocks' report, that a lower dam at Philæ would do better and thus spare Philæ, and it would be much safer, even though the cost were greater, to have several dams of a moderate height at points farther south. In the winter of 1891-92 surveys were also extended, and the second cataract in the Egyptian territory was, as far as possible, examined. Unfortunately the Dervishes prevent any scientific examinations of the Dâl site.

The Anglo-Indian engineers in the service of the Egyptian Government are all in harmony on the point that these dams must pass the flood through the dam at a low level, so that the river may flow in flood-time at about the same height as now. This is the only way to prevent the river-bed filling up with deposits from the silt-laden waters of the flood. The tunnels in the body of the dam to pass the flood-water would add greatly to the expense, and render regulation a matter of the greatest difficulty.

There is another scheme which has been pushed into public notice by the efforts of an American gentleman, Mr. Cope Whitehouse. It is one of the penalties that Egypt has to pay for the laziness and want of push of her own Turkish Governors, that men of all nations go there and try to urge the Government on to great public works. This does not happen to European nations; no one, for example, goes and worries the Dutch to drain the Zuyder Zee, but we leave them to do so when they think fit. The scheme is to use the large depression to the south of the Fayûm as a storage reservoir. It is called the Wâdi Rayyân, which means in Arabic "the valley habitually irrigated." Dr. Schweinfurth has failed to find any traces of fresh water in it, and certainly no Nile mud. Mr. Cope Whitehouse, from the study of a map of the second century A.D., declares it was a part of Lake Mœris.

The project was studied in 1889 by Colonel Western, R.E., who designed a small canal to be cut through the hills bordering the Nile valley. In my opinion this canal was too small, and the alignment on the slope of the Fayûm would have produced much filtration and consequent destruction of land in the Fayûm. The storage of the water would relieve the Delta of dangerous floods; but in a succession of ordinary years would reduce the floods of the Delta to an inconvenient degree, and render regulation on the Barrage in flood a necessity. But the present Barrage, which only holds up water in summer, could not be used in flood, as its design is altogether too weak. Very heavy works would be required to guarantee the abstraction from the Nile of 100 millions of cubic mètres *per diem* during the flood to fill the Wâdi Rayyân. The cutting through the hill is very deep, but presents no serious difficulties to a properly maintained rock-cutting plant.

The question of increased summer irrigation by storage of water is, as I have shown, largely mixed up with the reclamation of the lower Delta. But the most remunerative application of the stored-up water is in Upper Egypt, where there is practically a tropical climate. But the people are

not rich, neither are they educated and enlightened. So that if Government were suddenly to give water from the reservoirs, the country would fall into the hands of rich foreign capitalists who would dispossess the *Fellahin* and cause much discontent. The establishment of vast sugar factories requires much capital, and their owners would gradually, by loans, possess themselves of the land, converting the *Fellahin* into day-labourers. This is not at all good from a social point of view, and therefore I think the matter of reservoirs should be pushed very slowly. First, 10 million or so could be added to the discharge of the Delta canals; then a high-level canal with its barrages could be made in the high lands bordering the Nile for Kena, and Girga, and South Asyût.

But on no account would I abandon the basins. I myself believe, from what has occurred in the western Delta, that the desert sand, the old Typhon of the Egyptian mythology, would overwhelm much land. In addition to this, the difficulties in the way of drainage are very great, and the figures put forward lately by M. Prompt and Mr. Willcocks do not represent one-tenth of the sums necessary to remedy the evils attending on the introduction of summer irrigation throughout all Egypt. The river at Cairo would be thrown out of trim, and the high floods would come in August instead of the end of September, thus ruining much more cotton than now.

Appendix.—The following are some interesting statistics furnished by the resident engineer of the Abukir Company (Mr. R. Lang Anderson), and forwarded to me by the kindness of the Directors. The Company's original agreement with the Egyptian Government was as follows:—

"Three years to be allowed to complete the canals and drains, during which no land-tax to be levied; after that the land-tax to be, per *feddan* for 2 years, 1 piastre; for the 3 next years, 5 piastres; and after that 10 piastres for 5 years. Thereafter the same tax as similar lands in the neighbourhood." This has been since changed into L.E. 1000 for 10 years on the whole area of 29,621 *feddans*, and thereafter the same tax as similar lands. (An Egyptian pound [L.E.] = 100 piastres. There are 97½ piastres in the English pound sterling. A *feddan* is nearly an acre—really 4200 square mètres.)

The Company have, up to the end of 1892, reclaimed and sold 781 *feddans*, in 45 parcels, for £25,460. The payment is spread over 10 years. They are now arranging sales for 1590 *feddans*, in 5 parcels, at £20 a feddan.

Mr. Lang Anderson, from his experience on the spot and knowledge of the demand for land near Alexandria, is very hopeful of the ultimate reclamation of the lower levels, which are, of course, very salt. I had myself thought that this would be economically impossible with the pumps delivering the water into the sea. But in 1891-92 the Company and the Egyptian Government came to an agreement that the Company should make two syphon culverts under the Mahmûdiyah Canal, and pay the expense of cutting the drains to Lake Mareotis. They also agreed to make over the two 48″ Gwynne pumps and their engines to the Government. The Government agreed on their side to erect the two pumps and their engines at Mex to drain Lake Mareotis, paying for the removal and the erection. The Government also will run the pumps in future at its own cost.

These terms are very advantageous to Government, as the question of the drainage of Lake Mareotis was yearly becoming more and more acute, owing to the

extensive private reclamations of land in the Western Delta. To the Company this arrangement saves much expenditure in pumping, and gives a level in Lake Mareotis at least $1\frac{1}{2}$ mètres below the level of the Abukîr Lake. I consider that this Company will be a success, and not result in absolute loss, like its French and English predecessors.

THE DISTRIBUTION OF TEMPERATURE OVER THE SEA.[1]

THE intensity of solar radiation, which varies during the day with the height of the sun above the horizon, and in the course of the year with the declination of the sun and the latitude of the place of observation, has been worked out by Lambert, Meech, Wiener, Angot, and Zenker. Wiener denotes by unity the amount of radiated heat any given place would receive were the sun during the whole of the given time in the zenith, and if there were no atmospheric absorption. The daily, monthly, and yearly quantities of radiation must then be less than unity, and Wiener calculates their value with great accuracy to five decimal places. He calculates them for rays falling on the confines of the atmosphere, which are undiminished in power by the absorption they undergo in passing through the air.

Of these five decimal places, Dr. Zenker omits the last, and the remaining ten-thousandths he denominates *rays*, and indicates them by r, so that the annual heating of the Equatorial regions is due to 3053 r. He has also, in his *Die Verteilung der Wärme auf der Erdoberfläche*, shown how many of these rays falling on the outer boundary of the atmosphere penetrate to the earth's surface, and are there absorbed. This relation for the annual radiation may be expressed by the formula $Y = aI - b$, where I is the radiation on the confines of the atmosphere, Y its amount on the earth's surface, and a and b constants. For the sea the equation becomes $Y = I - 520\ r$.

Now it has been possible, from the temperatures of two Siberian stations compared with the radiation they receive, to determine the heating power of solar rays in terms of the ordinary thermometric scale (outside the atmosphere 54·4 $r = 1°$ C.), and hence the actual yearly temperatures of the air in the Pacific Ocean have been compared with those obtained from the equation. They exhibited in different latitudes the same differences as are given by the equation.

It would, however, be a mistake to suppose that the quotient of $I - 520\ r$ divided by 54·4 will give immediately in centigrade measurement the temperature of the corresponding latitude. This expression merely indicates the degree of insolation; the ultimate temperature depends, however, not only on insolation, but also on the initial temperature to which that of insolation is added. Only if this initial temperature were 0° C., would the formula give the temperature of the sea-air in degrees. The 520 r subtracted correspond to 9·56° C., and the resultant value of

[1] From an article by Dr. W. Zenker in *Petermanns Mitteilungen*, Bd. 39, No. 2.

insolation at the equator (3053 $r = 56{\cdot}1°$ C.) would be much higher than that found by observation. We must, indeed, subtract about 30° C. in order to obtain the actual air temperature in the western part of the Pacific. The initial temperature, to which the heat resulting from insolation is added, must, then, be $-20{\cdot}44°$ C. Of the origin and influence of this initial temperature Dr. Zenker has treated in his essay *Ueber den klimatischen Wärmewert, etc.* (*Meteorologische Zeitschrift*, 1892). It may be mentioned that its value at continental stations, even on the Equator, is far below 0° C.

That the actual temperatures do not everywhere coincide with those calculated by Dr. Zenker, and given in his table, is naturally to be expected, and this fact is an indication of the effect of various disturbing causes. In the Pacific Ocean the deviations, both positive and negative, vanish if the constant to be subtracted be fixed at $30{\cdot}5°$ C. But at many points the final results are not so satisfactory as when 30° C. is taken. Thus, at the Equator the calculated temperature will be $25{\cdot}6°$ C., whereas in reality the temperature over large areas is $26{\cdot}1°$, and for this apparent overheating no cause can be discovered. Therefore, Dr. Zenker has fixed his constant at 30° C., and with this value has calculated the temperatures, not only over the Pacific, but also over all the oceans and inland seas. The divergence of condition exhibited by the various sea basins constitutes the value of their examination from a common standpoint.

Having described the construction of his map,[1] on which the calculated and actual temperatures are indicated, Dr. Zenker proceeds to point out the lessons to be learnt from its examination. In this map the phenomena of the temperature and movement of the seas are clearly portrayed. Let us first consider the Pacific Ocean, where conformity to law is most marked. The sun, shedding its most intense heat down on the Equator, warms the middle of the ocean up to a temperature of $26{\cdot}1°$ C. (79° F.) Driven by the trade-wind, the Equatorial Current flows in from the east, after its water has swept in a broad stream up from the south along the American coast. As this stream bears colder water from high latitudes, the normal temperature can only by degrees be established in the Equatorial Current. Accordingly, even in 100° W. long. there is still a deficiency of heat amounting to $3{\cdot}2°$ or $3{\cdot}5°$ F., while in long. 115° the deficiency is $2{\cdot}3°$, and in 125° W. long. 2°. In 135° and 140 W. long. it is still perceptible, and only from 145° onwards does the normal temperature prevail. A further rise commences where the current washes the north coast of New Guinea, so that the waters are overheated when they pour through the Sunda Straits into the Indian Ocean.

On both sides, towards the north and south, the temperature of the Equatorial Current extends its influence outwards to the parallels of 20°. At 5° and 10° of latitude only an insignificant rise above the normal temperature is perceptible, never exceeding 5° F. in the western part of the ocean, while in the eastern the lower temperature of the affluent water predominates. At 15° of latitude we find that the divergence has

[1] *Petermanns Mitteilungen*, Tafel 4, 1893.

already increased to 2·9° F., the cause of which is made perfectly clear by adding it to the normal temperature 75·9°, for the sum is 78·8°, the temperature of the Equatorial air. The same condition obtains at 20° of latitude, where the normal temperature is 73·4°, but the variations in the north amount to four or five degrees. In the southern hemisphere, on the other hand, where the passage of the Equatorial water is retarded by the groups of the Low Archipelago, the overheating under the 20th parallel is extremely slight. In the northern hemisphere, the high temperature extends to 25° of latitude, though the sum of the excess and of the normal temperature (70·3°) is only 75·2°. A cooling has, therefore, already set in, which, under the 30th parallel, results in the establishment of a temperature, on the whole, about normal.

The wide extended prevalence of a negative variation, beginning at 35° N. lat., is a very evident effect of the cold north-west wind, which, coming from the winter pole of low temperature in East Siberia, exercises here and further northwards a cooling effect on the sea, as it does on the land.

In the seas along the coasts we also find cold currents, notably in the Okhotsk and Japan seas, where the falls of temperature are 14·4° and 10·8° respectively. In the East Chinese Sea also a cold current is found, which enters by the Corea Channel, and produces a cooling of four or five degrees.

In the open ocean the effect of the cold wind is more feeble. From 35° to 40° N. lat. it lowers the temperature 2° to 3½°. The warm stream of the Japanese coast, the Kuro Shiwo, which passes along the south of the island of Nippon, raises the temperature abnormally for only a short distance. But, in its further course towards the north-west, where it is hemmed in to the east by the peninsula of Alaska, it produces an excess of warmth. The Bering Sea is but little exposed to the cold wind, and, therefore, with a cooling of about 3½°, has in lat. 60° about the same temperature (32° F.) as the sea of Okhotsk in lat. 50°. The Bering Strait leads to the far colder Polar sea, and therefore is much colder than the Bering Sea. On the American side of the Pacific the water again moves southward, and enters regions where its temperature is below the normal of the latitude. The difference is first perceptible at 45° N. lat., and rapidly increases towards the south, amounting at lat. 30° to 9·5°. What a contrast to the Gulf of California, which is affected by the heat of Arizona and New Mexico, and in the same latitude is overheated to the extent of 9·4°!

In the southern hemisphere we find similar conditions. On the west side the heated waters are driven into higher southern latitudes, but, as already remarked, with less velocity than in the northern hemisphere. Consequently, over the whole eastern surface of the ocean, the temperature in high latitudes diverges very little from the normal. Only in the east, along the coast of South America, a cold current occurs, running from south to north (the Peru or Humboldt current), which is perhaps an effect of aspiration produced by the trade-wind, and probably consists of water drawn up to the surface from below. This water cools the sea-air to the extent of 7 to 9 degrees. At 55° S. lat. and 120° to 100° W.

long., a rise of temperature occurs which has much resemblance to that at the east of Alaska, and also, perhaps, is due to a kind of feeble southern Kuro Shiwo, which sweeps round from the Low Archipelago and the Kermadec Islands to the south-east.

Driven by trade-wind and monsoon through the Sunda Sea, the superheated waters of the Equatorial Current enter the northern part of the Indian Ocean, where, through contact with the heated land, their temperature continues to rise, and reaches 80° or even 82°. For in low latitudes contact with the land warms the sea, whereas, in high latitudes, it has the opposite effect. Thus, we find in the Bay of Bengal an excess of heat above the normal amounting to 6·7°, in the Gulf of Cambay to 7°, and in the Persian Gulf, including the Gulf of Oman, to 8·5°. But the Red Sea surpasses all the rest, having an annual excess of temperature no less than 9·4°.

The part of the Indian Ocean which lies south of the Equator is very similar in temperature to the Pacific, though, in the higher southern latitudes, it is far more affected by the South Polar influences. A broad cold stream strikes the south coast of Australia, and lowers the temperature 11° to 12½°. Not till the Tropic of Capricorn is reached is the water warmed nearly to its normal point.

Very different is the condition of the Atlantic from that of the two oceans already discussed. A movement of the whole mass of water from south to north is at once recognised; for over the whole southern half the temperature is too low, while in the whole northern half the water is superheated—in some parts to a very high degree. The cold water coming from high southern latitudes exhibits, as it passes from 40° to 20° S. lat., negative differences of 7° to 11° F. and more. After the water has been some time in the Equatorial Current this difference begins gradually to vanish, but even at Cape St. Roque, the most prominent point of South America, the normal temperature is not fully reached. But here occurs the division of the Equatorial Current into a northern and a southern branch, really caused by the stream-like movement of the Atlantic Ocean from south to north. A fifth part of the current (on an average; it ranges from a seventh in July to a fourth in January) is diverted to the south, and flows south-westwards along the coast of South America, while the remaining four-fifths skirt the northern coast of South America, and pour their now heated waters into the northern half of the Atlantic Ocean. On the coast of South America to the Straits of Magellan, the temperatures are nearly normal, but only over a narrow strip; eastwards lie the cold Polar waters into which those that have left the Equatorial Current are absorbed.

In the northern hemisphere, on the other hand, high temperatures immediately appear, which, up to 25° N. lat., correspond closely to those of the Pacific. Further north a narrow branch—narrow, at any rate, on the surface—of the Labrador current, coming down from the north and sweeping round Newfoundland, thrusts itself in between the warm Gulf Stream and the coast. To the east of it, the Equatorial heat, borne along by the Gulf Stream, becomes more and more pronounced. From 35° to 50° N. lat. the temperatures of the sea exceed the normal by a nearly

constant, though moderate, quantity ($3\frac{1}{2}^\circ$ to $4\frac{1}{2}^\circ$ F.), but beyond the rise becomes considerable; at 55° N. lat. the excess is about 7°, and at 60° of latitude nearly 11°; at 65° it has risen to 12·5° F., and even at lat. 70°, on the coast of Norway, it is not much less. There can be no doubt that the water of the Atlantic is drawn up in a mighty stream from the extreme south, is then slowly heated, and carries this heat with it to the frozen Arctic seas.

Here we meet with a sudden change: at 75° N. lat. the excess of warmth has considerably diminished, and soon after gives place to sub-normal temperatures. Nowhere are these so marked as in the Arctic Ocean. A milder tract seems still to exist where the Gulf Stream pours into the ocean, for between Greenland and Franz Josef Land the negative difference does not exceed 10°, while outside this tract it rises to 25°, and, though some doubt may be thrown on the exactness of these figures, the cooling effect of the land and ice in high latitudes is very evident.

But now the question presents itself, what becomes of the waters of the northern ocean which for thousands of years have continually received fresh additions from the Gulf Stream through the broad entrance from the Atlantic, and can find no other way out except through the Davis and Bering Straits? The Bering Strait is of scarcely any importance, partly because it is narrow and shallow, and partly because no large stream forces its way through it. More assistance is rendered by the Labrador and East Greenland Currents, which meet the Gulf Stream off the bank of Newfoundland, and in part dip below it, in part proceed southwards along the coast of North America. But they cannot advance beyond the Florida Channel at the furthest, and thence are certainly borne away northwards again by the Gulf Stream. The large volumes, however, which at Cape St. Roque are carried off from the southern hemisphere across the Equator, can only return to their original home by submarine currents, such as that we can observe starting on its journey near Newfoundland. The results of deep-sea explorations in the Atlantic also indicate the existence of such movements.

There remain to be considered the enclosed seas, for which the law may be laid down *à priori*, that in low latitudes they are overheated by the surrounding lands, while in high latitudes they must be abnormally cooled by the same influence. Many instances may be quoted confirming this law, though there are also many exceptions. We have the Red Sea, the Persian Gulf, and the Gulf of California, already mentioned as highly heated waters, and, in contrast to these, Bering Sea and the Seas of Okhotsk and Japan—all instances of the validity of the law. We may also add Hudson's Bay, which has a temperature as much as 18° F. below the normal, though it does not receive any accession of water from the Polar sea. Between these extremes we find intermediate examples, such as, in particular, the Mediterranean, Black, Caspian, and Aral Seas.

The Mediterranean is crossed by the parallel of latitude on which the solar land and sea temperatures are identical. This is the parallel of 40·5°, along which land and sea have an annual temperature of 77°, and which traverses the Mediterranean from the coast of Spain to the coast of Greece in about 20° E. long. The larger part of the sea lies to the

south of this line, and for this reason alone a superheating from the influence of the adjoining lands may be expected, and with still more confidence seeing that it is North Africa which forms the southern limit. Moreover, the winds from the overheated Atlantic Ocean blow over the sea. It is, therefore, not to be wondered at if the normal temperatures are far exceeded here, but it is worthy of attention that the excess is greater in the northern than in the southern division. While the excess amounts along the 35th parallel to about 3·8 F. (only to the east of Cyprus does it reach 6·1°), it rises in the Tyrrhenian Sea to 4·9°, in the Adriatic to 5·4° on an average, and in the Gulf of Genoa to 7·7°.

The Black Sea, which lies between 41° and 46° N. lat., shows in the south an excess of heat amounting to as much as 3·6°, but in the north there is a deficiency, never exceeding, however, 1·8°. The line of no variation is in this sea displaced somewhat to the north in consequence of the warm winds which blow from the Mediterranean Sea and the Atlantic Ocean; but the displacement is slight, and therefore the Black Sea affords an example of the law laid down for enclosed seas. The Caspian, which extends from lat. 37° to lat. 47° N., obeys this law still more closely. South of 40° N. lat. there is a slight excess of heat; at 40°, even near Baku, an almost perfect accordance with the yearly normal temperature; and in 45° a negative difference of 2°. In the Sea of Aral, which is bisected by the parallel of 45°, the temperature is 2·7° below the normal.

On the other hand, the seas of Northern Europe are exceptions to the rule, as, for instance, the Baltic and White Seas. The water of the Baltic, in spite of its position between 54° and 66° N. lat., is overheated in all its parts—between the Danish islands 5°, among the Aaland Islands as much as 5·8°, and even at the extreme north of the Gulf of Bothnia, and in the haven of St. Petersburg, to the extent of 3·4°. Off the Kurische Nehrung it is much the same. Evidently this warmth is to be ascribed to the effect of the wind blowing in from the Atlantic. It should be noticed that here the temperature is not raised by contact with the land, as in the southern seas, but diminished. The abnormal temperature of the White Sea may, probably, be similarly explained.

We can, then, as the result of our considerations with the help of the elaborated formula, draw the conclusions that abnormal heat is only produced (*a*) by the transference of volumes of water from lower to higher latitudes, (*b*) through contact with land in latitudes below 40°, and (*c*) by warm winds, such as those which blow from the Atlantic. Depression of temperature, on the other hand, arises from (*a*) the transference of water from higher latitudes to lower, (*b*) contact with land in latitudes above 40° (particularly in the Polar seas), and (*c*) cold winds, such as proceed from the Asiatic pole of cold. The simplicity of these results may well convince us that the formula on which we have based our examination is consistent with facts.

W. A. Taylor.

NOTE ON PROFESSOR MOHN'S ARTICLE.

In Professor Mohn's article on *The Climate of the Interior of Greenland* (March 1893, p. 144), a mistake has been made in the drawing of the isotherms for January. The line marked "$-30°$" should be marked "$-40°$," and a line representing the isotherm "$-30°$" should be drawn intermediately between it and the line marked "$-20°$."

ED.

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

Mr. F. C. Selous addressed a meeting of the Society in the Lecture Hall on the 9th March, his subject being "Twenty Years of Travel in South Central Africa." Mr. A. L. Bruce presided. A vote of thanks was proposed by Sheriff Mackay and seconded by Mr. F. Moir.

The Rev. Dr. James Stewart of Lovedale delivered a lecture on "East Africa: its Coast Line and the Territories of the Imperial British East Africa Company" at a meeting of the Aberdeen Branch on the 14th March, when Lord Provost Stewart took the chair. A vote of thanks was proposed by Sir John Clark of Tillypronie and seconded by Mr. Ferguson of Kinmundy.

Colonel Justin C. Ross, C.M.G., (late) R.E., read a paper in the Society's Lecture Hall on the 23rd March, on "Irrigation and Agriculture in Egypt." Major-General Sir Robert Murdoch Smith occupied the chair. A vote of thanks was proposed by Professor Wallace. Colonel Ross repeated his lecture at a meeting of the Glasgow Branch on the 27th March. Sir W. Renny Watson presided, and vote of thanks was moved by the Chairman.

The following Resolution, passed by the Council of the Royal Geographical Society of London on the 27th February, has been communicated to the Society:—

"The following privileges should be offered to such of the Geographical Societies of the Empire as shall, from time to time, be recognised by the Council as Corresponding Societies:—

(1) All Fellows and Members of such Geographical Societies to be allowed, while in London, the privileges of admission to the Society's meetings, and of the use for purposes of reference of the Map Room and Library.

(2) The Presidents and Secretaries of such Societies to be invited to the banquets and entertainments of the Royal Geographical Society as guests of the Society.

(3) A copy of all the publications of the Royal Geographical Society to be sent to such Societies, and their members to be allowed to purchase copies of the same on the same terms as Fellows of our Society pay for extra copies.[1]

(4) Diagrams, slides, and hand-maps, the property of the Society, to be lent for the use of such Societies in the United Kingdom on the same terms as they are lent to the Scientific Societies of the Metropolis. Copies of any such geographical material to be supplied to the Geographical Societies of the Empire at cost price."

The above Resolution was accompanied by an intimation that the London Society desires to establish with this Society the relations therein indicated.

[1] The amount payable for *The Geographical Journal* will be eighteenpence per copy.

The Council of this Society, at a meeting held on the 27th March, passed the following Resolution :—

"The Council has received with satisfaction an intimation of the privileges accorded to members of this Society by the Royal Geographical Society of London, in their Resolution of the 27th ultimo ; and desires to express its cordial acknowledgments to the Council of that Society.

It is resolved that the undermentioned privileges be offered to the London Society, and to such other of the Geographical Societies of the Empire as may, from time to time, be recognised by the Council as Corresponding Societies :—

(1) All Fellows and Members of such Societies to be allowed, whilst in Edinburgh, Glasgow, Dundee, or Aberdeen, the privilege of admission to the meetings of this Society, and, when in Edinburgh, of the use, for purposes of reference, of the Society's Library and Collection of Maps.

(2) The Presidents and Secretaries of such Societies to be invited as guests to any entertainments that may be given by this Society.

(3) A copy of all this Society's publications to be sent to such Societies, and their Members to be allowed to purchase copies of the same at the rates paid by Members of this Society for extra copies.

(4) Diagrams, slides, and hand-maps, the property of this Society, to be lent for the use of such Societies in the United Kingdom, on payment of the cost of transmission only."

The following revised Library Regulations were passed by the Council on the 22nd February :—

1. All books shall lie on the tables in the Society's Hall for one month after their receipt. They shall then be placed in the Library, and may be borrowed by Members.

2. All books thus borrowed shall, before removal from the Library, be handed to the Librarian to be registered in a book kept for that purpose.

3. No unbound volume, or part of any serial or periodical, shall be borrowed without the special consent of the Librarian.

4. Should a Member lose any volume, or return it in a damaged state, he shall be liable for the cost of a new copy or of the necessary repairs, or shall replace the damaged volume by a new copy, as may be decided by the Library Committee.

5. A call for books shall be made once a year, viz. on the 31st October. Members retaining books beyond that date shall be liable to a fine of sixpence weekly per volume during the time of such retention.

6. Members shall return the books they borrow within six weeks, or ask for an extension of time. The Librarian shall have power to call in a book after it has been out a week. Should this rule not be complied with, the fine mentioned in Rule 5 may be imposed.

7. Members who may require books to be sent to their residences shall pay all charges for carriage.

8. Members failing to comply with any of the above rules are debarred from the use of the Library.

9. The Library Committee, with consent of the Council, shall have power to add to, or otherwise modify, the above rules, as may seem expedient.

Scottish Geographical Magazine.

In consequence of the indisposition of Colonel Bailey, the Council has decided that Mr. W. A. Taylor, Librarian, shall perform the duties of Acting-Editor until October 1st.

GEOGRAPHICAL NOTES.

By W. A. Taylor, M.A., F.R.S.E.,

Librarian, R.S.G.S.

ASIA.

From Teheran to the Caspian Sea.—There are two well-known routes leading from the capital of Persia to the Caspian, the one through Resht, and the other through Meshed-i-Ser. Besides these there is another, much shorter than either of the others, but not used by caravans, as it connects no centres of industry, and terminates at a lonely part of the Caspian shore. The road has been made solely for the convenience of the Shah when he goes to Mazanderan to hunt. In December 1889, Dr. N. Danilof traversed this route, passing Kamranieh, the country seat of the Shah's son, Naib-es-Sultaneh, and the village of Neaveran, and then commencing the ascent of the Shemran pass. The road was steep and difficult for horses, so that part of the baggage had to be transferred to the backs of mules. After an hour and a half a small plateau was reached, from which towards the south Teheran could be seen and the salt lake of Saveh (Hauz-i-Sultan Kavir) beyond, while to the north stretched a desolate rocky defile, closed at the farther extremity by a stony ridge. Along the eastern precipice the caravan proceeded to the foot of the ridge, which was so steep that Dr. Danilof was obliged to dismount and make his way to the top on foot. Here, on the highest point of the Shemran pass, the vegetation consisted only of a few lichens, and no living animal, not even a bird, was to be seen. The caravan then descended into a narrow valley, shut in on the east and west, in which is situated the country house of the Shah. The road was in bad condition, being often crossed by runnels eroded by the spring torrents, for it had not received the usual repairs, as the Shah was not expected that year. The valley, watered by the river Shekhristanek, is exceedingly pretty. Near a village of some size, called by the same name as the stream, it is fully one-third of a mile wide, but lower down it contracts until only room enough is left for the river, and travellers must take to its bed. Presently the Shekhristanek unites with the Haji-Sir, flowing from the north, and forms the Herd-Rud. This river runs at first westwards, but in its lower course turns to the south, and 26 miles from Teheran emerges on to the plateau of Iran under the name of the Karij. From the confluence the caravan ascended the gently-rising valley of the Haji-Sir. The mountains leave room between them for small level stretches, which are laid out in fields, where barley and vegetables are grown. Irrigation channels run in all directions, sometimes bordered by willows. Goats and sheep feed on the mountain sides. At its upper extremity the valley is shut in by the high mountain which forms the watershed, and is called the Kendy-van. Up its flank the path ascends by numerous windings, and then descends to the valley of the Chalus, which runs from south-east to north-west and extends to the shores of the Caspian. On reaching the main stream, Dr. Danilof entered a different kind of country: the valley opened out to a breadth of three to five miles, and the gently-sloping sides were clothed with woods of nut-trees, oak, hawthorn, dogwood, maple, and wild rose. The road in some parts has evidently been constructed with much labour, blasting having been necessary, and in one place the rock is perforated by a short tunnel. Sometimes smoke was seen rising from the wood, where charcoal-burners were preparing fuel for sale in Teheran. As lower ground is reached, the vegetation becomes more luxuriant: myrtles, figs,

and almond-trees appear, draped with ivy and other creepers; the song of birds is heard, and tracks of wild-boars are seen among the reeds by the riverside. Six miles from the sea trees give place to shrubs, which extend to the shore. Rice is cultivated on the low-lying coast, and is exported to Russia and Western Europe through Resht and the port of Meshed-i-Ser. Traffic is carried on along the shore between these towns. Five yards from the bank there is water enough to take a man out of his depth, but there are no bays to shelter vessels. Abundance of fish are caught in the mouth of the Chalus.—*Izvestiya* of the Russ. Geogr. Soc., Part 4, 1892.

AFRICA.

Captain Binger's Mission.—Monsieur Marcel Monnier, who accompanied this mission, delivered an address to the Paris Geographical Society in December last (*C. R.*, Nos. 17 and 18). The distance traversed was about 1200 miles, of which 300 lay through new country. M. Monnier distinguished two regions very dissimilar in geographical features and in the character of the inhabitants. A forest region was first traversed, extending to a depth of 250 to 300 miles from the coast —a zone of dense vegetation, with creeks of stagnant water, and rivers flowing under arcades of overhanging trees and encumbered with fallen trunks. The villages, situated at long intervals, are connected by winding paths like tracks of wild animals. Even from the summits of the hills, which rise to a height of 300 feet above the plains, no view could be obtained, for the vegetation is as dense here as on the low grounds. As the traveller advances northwards the woods become thinner, clearings grow more and more numerous and of greater area, and there is abundance of light and air. Large herds of cattle graze around the villages. This is the plateau of the Sudan, lying, near Bonduku, at an elevation of 1300 feet, and rising to 2000 or 2200 in the neighbourhood of Kong. No less striking is the difference between the natives of these two regions. In the forests dwell remnants of tribes that have fled before the face of more energetic races, and have abjectly accepted defeat. Nature supplies them gratis with the necessaries of subsistence. Intellectually and morally they are very debased; they are insensible alike to kind treatment and reproaches, and are ready to give way before the slightest difficulty. Beyond the forest the country is occupied by the Mande-Diula, a Musulman race from the north, active, industrious, and inured to toil, experienced traders and agriculturists. Their villages attain the dignity of towns, both in size and architecture. The Islamism they profess is but an effete sentiment, and the observance of its rites is simply a question of decorum. There is no fanaticism or intolerance, and no prejudice is exhibited towards an infidel, black or white.

On January 11th, 1892, the expedition landed at Assinie, situated on a strip of sand barely 300 yards broad, which cuts off the lake of Aby from the ocean. Having procured porters from the King of Krinjabo, the expedition proceeded up the Tanoe to Nugua, the leaders completing the journey by boat in three days. The distance is only some 35 miles as the crow flies, but the windings of the river increase it to more than double, and banks of sand and fallen trees render navigation extremely slow. But far more wearisome was the march from Nugua to Ngakin and Asswakuru, across ravines with steep flanks, through swamps where the traveller sinks up to the waist in mud, and amidst heaps of decaying vegetation, creeks of stagnant water, thorn brakes, and large interlacing and contorted roots. At length the difficulties of the route and the impossibility of obtaining provisions forced the party to turn westwards, and pass from the valley of the Tanoe to that of the Bia. After twenty-four days' march, the edge of the forest was reached at

the village of Sapia. In five hours more the caravan marched to Bonduku, crossing the chain of hills which separates the basin of the Comoe from that of the Volta. The town of Bonduku stands out a compact mass of ochre colour against the green of the fields. It is a typical Saharian town—a labyrinth of narrow streets and massive houses with windows opening on to inner courts. Its dirtiness is excessive, and is owing to scarcity of water. A watercourse filled only in the rainy season lies a hundred yards from the town ; at other seasons a supply of water is stored up in pits, into which the rain washes all the refuse of the neighbourhood. The inhabitants, seven or eight thousand in number, have, by their laboriousness and activity, monopolised the trade of the surrounding country. They carry on the occupations of merchants, transporters of goods, brokers and money-lenders, and are ready to enter into any kind of speculation. From Bonduku to Kong, a distance of about 185 miles, there is a path practicable for baggage animals. The country, except in the neighbourhood of Bonduku and where a chain of hills skirts the right bank of the Comoe, is rather monotonous, consisting of slightly undulating plains covered with tall grass and a few detached clumps of trees. The villages, standing about three or four hours' march apart, are all composed of huts of the Malinke form—round, with a conical roof—and are surrounded with fields of *sorghum*, yams, and maize. The herds of cattle are magnificent, and goats and sheep are kept in considerable numbers. Several caravans were encountered daily—some coming from Kong, and others bringing from the Buna country ivory, cotton, and salt, a few iron goods of native manufacture, and fine wools from Masina. These colporteurs are Mussulman Diula, while the autochthonous inhabitants of the villages are Pakhalla, who are subject to the men of Kong and Bonduku. They are gentle and hospitable, but cling as closely to fetichism and its wild ceremonies as the people of the forest.

Kong, like Bonduku, is an agglomeration of buildings of adobé, forming a labyrinth of lanes, with heaps of refuse which give out most offensive odours. But, though it contains two or three times the number of inhabitants, the air is purer than at the latter town, for Kong stands on an elevation running from east to west at an altitude of 2300 feet above the plateau. At Kong the members of the expedition took different routes, Dr. Crozat setting out for the north, and Lieutenant Braulot marching eastward towards the Buna country, while Captain Binger and M. Monnier returned to the coast through Jimini and Jammala. Between Kong and Jimini the country is sparsely populated. Wandarama is the most important place ; the capital of Jimini, Dakhara, is almost depopulated. Thus far the party followed Binger's route in 1888 (see vol. vi. p. 205), but at Natere they turned south-westwards to enter Jammala. In all the villages—Jidana, Welasso, Dieleadugu—the travellers were most hospitably received, though Europeans had never visited the country before. On the third day after leaving Jimini the party crossed into the basin of the Isi (or Agniby) and a day later reached Satama, where a treaty was made with the King of Jammala. Being prevented by the natives from marching to Wassaradugu on the Isi, where they had hoped to obtain canoes, Captain Binger and M. Monnier were obliged to make their way to the Comoe, which they reached at a point opposite Attakru. Here they procured boats, and descended to Alepe.

The Mobangi and the Shari.—A sketch map of M. Dybowski's route between these two rivers is published in the *Comptes Rendus*, Nos. 15 and 16. The watershed lies at 6° 30′ N. lat. All the streams crossed by M. Dybowski between the post of Bembe, on the Mobanghi, and the watershed flow towards the south-east and probably join the Kwango, the important affluent of the Mobanghi first

explored in its lower course by Captain Van Gèle. The Shari, at the part where M. Dybowski struck it in November 1891, is called Kukuru. It was here, in the dry season, only about 65 yards broad, but false banks running beside the river show that during the rains the water must expand to a breadth of 200 yards. At the time of crossing it had a depth of 13 to 16 feet, and a bridge had to be thrown over it. On the right bank of the Shari rises an eminence, which M. Dybowski named after M. Crampel, and at its foot is the village of Mahoru or Mpoko. Its position is in lat. 7° 26′ 30″ N. and long. 20° 14′ 44″ E. M. Dybowski's map also shows the course of the river Kemo from the post established in 6° 17′ N. lat., at an elevation of 1570 feet, to its mouth. Judging from its volume, the explorer supposes that its source lies at a considerable distance to the north of the post, and that, therefore, the watershed between the Congo and the Shari basins must run north-eastwards.

AMERICA.

Lieut. Peary's coming Expedition.—Mr. Cyrus C. Adams has published in his paper, *The Sun*, a sketch of the plans of this expedition, authorised by the leader. Lieut. Peary will start between June 15th and 30th for a two years' sojourn in the Arctic regions. He will limit his party to ten picked men, and will establish his winter quarters a little to the east of M'Cormick Bay, where he spent his last winter. The house will be built on the north coast of Inglefield Gulf, at the head of Bowdoin Bay. From this point it will be far easier to reach the ice-cap than it was from Redcliffe House. Last spring the party had a very hard task in hauling their supplies over broken ice for forty miles before the ice-cap was reached. As soon as the ice is in condition for autumn sledging, Lieut. Peary will make a detailed survey of Inglefield Gulf, and will send out a party with supplies to make a *cache* on the route to the north, while the hunters of the expedition will be engaged in obtaining a supply of meat. Last year the inland journey was not fairly commenced until May 15, but next year the explorer proposes to start in March. He intends to try a novel experiment in Arctic travelling. Ponies shod with rough snow-shoes are used in some parts of Norway, and Mr. Glave succeeded in fitting snow-shoes on horses in Alaska. Mr. Peary, therefore, proposes to supplement his team of dogs with a number of donkeys or ponies, and if the experiment succeeds, his progress will, he believes, be greatly facilitated. The party for the north will consist of only four or five men besides the leader. The outward route will be chosen somewhat to the south of the one followed last year, in order to avoid the crevasses at the head of the fiords, while, at the same time, it will be to the north of the route by which Lieut. Peary and Mr. Astrup returned from Independence Bay, when they ascended to a height of 8000 feet, and were for some days enveloped in mist. On the arrival of the party at Independence Bay, two or three men will be sent off southwards to explore the unknown coast down to Cape Bismarck, whence they will return direct to Inglefield Gulf. Lieut. Peary himself will turn northwards to examine the archipelago which lies in that direction. Should he be obliged to spend a winter in this region, he and his companions will build houses of stone and snow, such as the Eskimo erect. He is certain that he can depend for food on musk oxen, to which perhaps seals and Arctic hares may be added. There is no evidence from what Mr. Peary saw on his previous expedition, or from Lockwood's experience on the western coast, that the islands are covered with continuous ice, and it is probable that the party will have to take their sledges through the channels between the islands. Should the ice in these channels not be favourable for travelling, the task of exploring will be extremely formidable. Of any possible extension of his work towards the Pole itself, Mr. Peary has little

to say. Should, however, the floe to the north of the furthest land reached be favourable to further progress, it is not improbable that Mr. Peary will leave his land basis for a journey across the sea.

Lieut. Peary hopes to make arrangements to have a vessel sent to take him home in 1895. Letters may, however, be expected from him in 1894; during his last expedition he successfully employed Eskimo as letter-carriers. Lieut. Peary will sail for Europe in the beginning of May to lecture before some of the geographical societies of Europe, the Royal Scottish Geographical Society being among the number.

Alaska.—In the spring and summer of last year Messrs. Glave and Donald made a journey from the Chilkat river to the country north of Mount St. Elias. A great obstacle to travelling in this region is the difficulty of transporting the baggage. An Indian carries a load of about 90 lbs., and consumes fully 3 lbs. of provisions daily, so that it is almost impossible to make a journey of a month's duration. Mr. Glave, therefore, tried the novel experiment of taking horses to Alaska, and the result was very satisfactory. Landing at Pyramid Harbour, near the mouth of Chilkat Inlet, the party proceeded to the village of Klokwan, 25 miles up the Chilkat river, where they waited until the end of May, when the weather had become warmer and the snow had disappeared from the valleys. Then the journey was commenced by the ascent of the Klahina river, a rapid stream 100 yards broad, which flows from the west to join the Chilkat. Sometimes, when the rocks, descending to the water's edge, barred further progress, the river had to be crossed by swimming. Further on the stony valley of the Klahina was left behind, and the ascent of the outliers of the Rocky Mountains, which form the coast range, was commenced. At first a path had to be cut through the pine woods which clothe the lower slopes; then followed bushes and grass; and still higher nothing was to be seen but snow and moss-covered rock. Slowly and with great difficulty the expedition mounted to the summit of the ridge, at a height of 4750 feet, and found themselves on a plateau several miles broad. After two days' journey in a nearly northerly direction from the Klahina river, a broad valley, clothed up to the snow-line with fir-woods, was reached. Avalanches, ice, and rushing mountain torrents had deeply eroded the flanks of the mountains, and a roaring river still carried snow-water westwards. Sometimes through woods, sometimes over enormous glacial deposits—blocks of stone, gravel, and sand—and again over rich meadows or through swamps, Mr. Glave made his way in two days more to the Indian village, Neska-ta-hin, where his horses excited the greatest astonishment among the natives. This village is a centre of the Gunenar Indians, who belong to the Athabasca or Tinneh tribe. They are mild and peaceful people, dependent on the Chilkats of the coast, whom they regard as their superiors. Neska-ta-hin is a great trading station; the inhabitants range the country in winter in pursuit of game, and exchange the furs with the Chilkats for blankets, guns, powder, and tobacco. All around extends comparatively open country. To the south the valley of Altseck river extends to the Pacific; to the west the traveller can proceed to Mount St. Elias, or can reach the lakes on Canadian territory, the Ishi-ik and Dassar-di-ash, to the north.

The Indians would not guide Mr. Glave northwards, but they drew him maps with wonderful skill, considering that pen and paper were new to them. These maps proved to be accurate, and were subsequently of great use. During the first two days the path ran through a large valley running northwards, where fertile meadow-land, bright with innumerable flowers, alternated with woods, and murmuring brooks descended from the hills to join the main stream. Unfortunately the

traces of forest fires marred the scene, for the Indians set fire to the trees round their encampments simply to drive off the mosquitos, and recklessly allow the fire to spread, so that whole forests are yearly destroyed. Consequently the fauna is poor; a few squirrels, ptarmigan, and partridges were the only forms of life visible. The larger game takes refuge in the mountains, where the wind is fresh and the insects cannot follow them. Having crossed a pass 6500 feet high, Mr. Glave entered a wide swampy valley 70 miles from Neska-ta-hin. Here he was fortunate in meeting two Indians, who were returning from a trading expedition to their home by the Huchy-Eye lake. Under their guidance the party after a march of 25 miles reached the Kaskar Wulch river, fed by the waters of the Mount Elias glaciers and flowing into the Altseck. This river, more than 400 yards broad, was crossed on rafts, and the journey was continued for three days through rocky valleys and a labyrinth of swamps and lakelets, and then through fertile grass land to a well-wooded valley. It is called Shakwak by the Indians, and runs in a north-westerly direction, from the Kusu-ah lake almost to the eastern branch of the Copper river (not the Copper river of maps, but the White river). Here the Indian guides had their summer residence, consisting of roughly constructed huts of branches, the roofs of which were laden with the dried flesh of reindeer, elk, mountain goats, squirrels and fish, collected for a winter store. The Indians grow no crops, but subsist entirely on meat and berries; strawberries, gooseberries, bilberries, and others are plentiful. The Indians have few guns, and use in hunting bows and arrows tipped with bone, copper, or iron. Of copper they possessed large pieces, which were said to come from the White river, so named from the milky colour of its glacier water, but known to the natives as the Copper river.

This Indian village was the most northern point reached by the expedition. It is situated about 100 miles to the north-east of Mt. St. Elias, and south of the unexplored lakes of Huchy-Eye and Ishi-ik. The distance from the latter was not great, but no guide could be procured. The party visited, however, the Tlu-Arny lake to the south-west. At its southern end it is nearly 7 miles broad, and it stretches northward as far as the eye can see. The Indians declared that they camp seven nights on the march from one end to the other, and that at the northern end the water of the lake is carried off by a tributary of the Yukon. Streams descend on all sides to the lake, and the surrounding mountains are rich in cinnabar. On his way back, Mr. Glave, after crossing the watershed, struck the Taryansini, a tributary of the Altseck, which, 50 miles to the north of Neska-ta-hin, unites with another stream coming from the Kluk-Shu lake. The Kaskar Wulch, rising in the vast glaciers near the Tlu-Arny lake and swollen by the waters descending from Mt. St. Elias, makes it way southwards through rocky gorges, and, after receiving a tributary from the lake Dassar-di-ash, unites with the above-mentioned streams to form the Altseck. This large river, with a current of eight knots, pours its waters into Dry Bay to the east of Yakutat.

The region traversed by this expedition may be divided into three zones. The coast mountains, covered with ice and snow, are first crossed; on their northern slopes are found sterile rocky valleys, while further inland stretch rich meadow lands, with luxuriant vegetation and a summer climate, in which strawberries and other fruit can ripen. In June and July, though the nights are cold, the mean temperature is 62° F.—*Globus*, Bd. lxiii., No. 7.

Venezuela.—The task of exploration undertaken by Dr. Sievers (vol. viii., p. 498) has thus far been accomplished with great success, in spite of many difficulties. In a letter to Baron von Richthofen, published in the *Verhandl. der Gesell. für Erdkunde zu Berlin*, the traveller relates how, after some delay owing to the

revolution, he set out from Puerto Cabello in September, and, passing through Carabobo, crossed the *llanos* and reached Barquisimeto. Hence he proceeded to Carora and Coro, accomplishing the first part of his programme in three weeks. The worst enemy he had to encounter was the weather. During the whole journey deluges of rain descended, such as had never been experienced before by any of the natives, and on October a storm occurred which damaged every railway in the country, carried away almost all the bridges, and undermined the roads. Everywhere lay swamps and mud, and on his return from Coro, Dr. Sievers, being unable to follow the coast owing to its swampy state, was obliged to pass over the mountains of the interior. He had thus an opportunity of ascertaining that the whole interior of Coro and Lará is formed of numerous ranges running towards the east-north-east, of which really nothing is known. They are of considerable elevation, for Professor Sievers had to cross six passes 2900 to 3600 feet high. Between November the 17th and 24th the explorer was in Yaracui and at the mines of Aroa, and found that the mountains of north-eastern Venezuela extend westwards to the Rio Aroa. In the beginning of December he intended to visit the lake of Valencia (Tacarigua), and proceed to the *llanos* of Paz and Ortiz. Passing then southwards, he hoped to be on the Orinoco in February and March.

The Western Lowlands of Ecuador.—In the *S. G. M.*, vol. viii. p. 220, a note was published on an article by Dr. Theodor Wolf on the Andes of Ecuador. The author has now completed his sketch of the country by a description of the western lowlands, published in the *Verhandl. der Gesell. für Erdkunde zu Berlin*, Bd. xix., Nos. 9 and 10. As indicated in the note referred to above, Ecuador may be divided into three regions, the central Highlands and the Andes, the eastern lowlands, and the western lowlands. The last section is certainly the smallest, but it is exceedingly important and interesting, and, indeed, covers an area that may be estimated at over 29,000 sq. miles, or as large as the kingdom of Bavaria.

Up to the end of the Tertiary period the ocean washed the feet of the western cordillera along its whole length. A narrow range of chalk, running from Guayaquil westward, and then turning northwards into the province of Manabi, and a few isolated peaks rising as islands out of the sea, were the only portions then existing of Western Ecuador. At the conclusion of this period, or the beginning of the Quaternary, the provinces of Menabi and Esmeraldas rose out of the ocean, while over the southern portion of the area a thick layer of sandstone was being deposited. This was raised at a very recent period, and, last of all, the alluvial plain extending to the east and north of the Gulf of Guayaquil, and other smaller alluvial plains at the mouths of rivers, made their appearance. The highest mountains now existing in Western Ecuador are found in the chalk range, and rise to a height of 2300 feet. In the Tertiary formation there are summits of 700 to 1000 feet in height, while the Quaternary deposits form a gently undulating country with an elevation of 70 to 250 feet, and the alluvial plains are quite flat. As the highest elevations of Western Ecuador run along the coast at a considerable distance from the cordilleras, the waters, which collect into rivers at the foot of the latter, do not run due west to the ocean, but turn north and south, forming two extensive drainage systems. The larger and more beautiful comprises the Rio Guayas with its complicated series of channels; that of Rio Esmeraldas, in the north, enters the sea exactly under the first parallel of north latitude, and forms no delta. These two systems are separated by a watershed so low that canoes can easily be transported from the one to the other. Though the northern and southern parts of the lowlands exhibit a close resemblance in their orographical and hydrographical features, in their climatological and other conditions they are very dissimilar.

The former is an almost uninhabited country covered with damp forests, whereas the latter is of varied character, well-peopled and cultivated. The boundary between these portions runs from Cape Pasado south-eastwards, nearly in the direction of Chimborazo, so that the upper feeders of the Rio Guayas are included in the northern division. One cause of the dissimilarity of climate may be that the ocean along the coast north of Cape Pasado has a mean temperature of 82° F., whereas to the south its temperature is only 73°. The larger volume of the Antarctic current, which washes the shores of Chili and Peru, turns westwards at Cape Blanco, but a smaller part continues northwards as far as Cape Pasado.

The northern division possesses a hot and rather damp climate, and, consequently, a very luxuriant evergreen vegetation, which extends from the cordilleras to the coast. Water is extremely abundant, but, forming swiftly flowing streams and never lying stagnant, it does not render the climate unhealthy, and cannot be the cause of the sparsity of population. The forests are magnificent, containing palms, useful timber, cocoa, caoutchouc, vegetable ivory, vanilla, etc. The rich humus which covers the ground is adapted for the cultivation of the finest tropical produce, but the country is, for the most part, uninhabited, and the population, barely 15,000 in number, dwell almost exclusively on the coast, and pay little attention to cultivation. Dr. Wolf has no other explanation to give of this stagnation than the natural indolence of the Spanish-American race. One tribe of pure Indian blood, the Cayapas, yet remains in the basin of the river Cayapas, and in the forests of Esmeraldas are two villages of Negroes, which probably date from the emancipation of slavery in 1854.

The southern lowlands present quite a different picture. Here diversity of climate and the work of man have caused a great variety in the scenery and vegetation, both wild and cultivated. Of especial interest are the Gulf of Guayaquil and the basin of the Rio Guayas. The latter comprises about 9600 sq. miles of exceedingly fertile and well-tilled land, such as cannot be matched elsewhere on the whole west coast of South America. Whereas in Esmeraldas the highest temperature is found on the coast, the contrary law holds here. In the neighbourhood of the gulf the mean temperature is 73° to 77° F., and the short rainy season, lasting only through February and March, does not yield enough moisture to maintain a luxuriant vegetation. In low-lying districts cactus and mimosa are the characteristic forms, with a thin carpet of grass during the rainy season, and cultivation depends on artificial irrigation. Drinking-water is collected in cisterns, streams of fresh water being found only where mountains come down to the coast. A few miles inland the climate begins to alter; the humidity increases, the temperature rises, and the vegetation shows a corresponding improvement. The climate is healthy, for though yellow fever sometimes visits the town of Guayaquil, being brought from Panama, it is not endemic. The thermometer never sinks below 68° F., but, on the other hand, it seldom rises above 90°. The seasons are also more sharply defined than in the elevated regions or in the moist districts. The numerous rivers compensate for the small rainfall in the summer months, and the greater part of the southern lowlands lie in the zone where the rainy season has a longer duration, and so much dew falls in summer that trees can retain their leaves throughout the year. This zone begins in the basin of the Rio Guayas on the Rio Daule, on the main stream (Rio Babahoyo) a little above Zamborondon, and on the Rio Chimbo above Yaguachi—in general, where brackish water ascends during flood-tide. The rivers carry down considerable volumes of water at all seasons, and are navigable even in the driest weather. The Rio Guayas has a breadth of nearly 2200 yards at Guayaquil, with a depth of 50 feet, and 18 miles further up it is still 1500 yards broad. In the rainy season the volume of water is enormous,

and spreads itself over large areas, forming large lakes from Guayaquil down to the mouth of the Rio Naranjal, and filling the gulf with fresh water. The beds of the streams, however, are still well defined, for they are enclosed by banks which rise 18 inches to 3 feet above the highest level of the water. These banks (*bancos*) are often three-quarters of a mile broad; they are the work of the streams, and are found not only beside the rivers, but also crossing the country in all directions, where beds of streams have formerly existed. The mountain land yields valuable natural products, and where the humidity is sufficient it is adapted for cultivation, and is, to a great extent, planted with cocoa, coffee, sugar, bananas, etc., but the chief field for agriculture is the plains, and especially the *bancos*. All the products of this land are of excellent quality, but are little known because they are exported in small quantities. The coffee is far better than the Brazilian, the tobacco will bear comparison with that of Havana, but these articles do not find their way to European markets, and, were it not for the cocoa, Ecuador would not appear in the columns of trade periodicals. Cocoa forms the principal wealth of the country, coffee has been more extensively grown of late years, and sugar is now exported in considerable quantities. Tobacco, rice, and cotton are of less importance, while tropical fruits are shipped to all parts of the Peruvian and Chilian coasts. Caoutchouc is collected in ever diminishing quantities, for the trees are recklessly cut down to obtain their sap, and, like the cinchona of the uplands, are fast approaching extinction.

The population of the southern lowlands may be estimated at 210,000, of whom about 20,000 are of white race, while the rest are composed of Negroes, Indians, and half-breeds. Indians of pure blood are found chiefly in the dry coast districts of Santa Elena and Manabi, where, besides grazing, they are engaged in the industry of Panama hat-weaving. These hats are made from the fibres of the *Toquilla* (*Carludovica palmata*), and are of numerous qualities, ranging in price from eighteen pence to £15 or £20. There are several large villages in the lowlands containing 3000 to 4000 inhabitants, but the greater part of the population are scattered over the country, particularly along the rivers, in small hamlets, on farms, or in isolated houses. Guayaquil, the commercial capital and the chief port of Ecuador, lies on the right bank of the Rio Guayas, about 35 miles from its mouth. It is a rapidly progressing town, and during the last fifteen years has doubled its area and population.

Uruguay.—According to a recent report of the British Vice-Consul at Montevideo, the population of this State in 1890 was estimated at 748,000. Labour is much needed, and the attempts made to stimulate immigration have been costly and unsatisfactory. Gold, silver, copper, magnesium, and lignite are to be found in the northern departments, and large quantities of valuable stones, such as amethyst, agate, topaz, and opal, are exported to Germany. The foreign trade has increased during the last thirty years, but during the past ten the exports have remained almost stationary. The latter consist principally of farm produce and jerked beef. In 1890 the total value of the imports was £6,800,000, and of the exports £6,188,480. Great Britain sent 27 per cent. of the imports and took 13 per cent. of the exports. Uruguay possesses great advantages in its soil and climate, but the absence of bridges and made roads, and the inveterate indolence of the natives and half-castes, hinder the agricultural development of the country.—*The Times*, November 1st, 1892.

OCEANIA.

The Gilbert Islands.—A few details concerning these islands, which, as announced in vol. viii. p. 616, have been annexed by Great Britain, are given in *The Colonies*

and India, December 10th, 1892. The group extends across the equator from 3° 30′ N. to 2° 45′ S. lat., lying chiefly to the east of the 170th meridian of E. long. The most important island north of the equator is Taritari, or Touching atoll, which is 11 miles long, and contains a population of 3000. Tarawa, or Cook atoll, is larger, being 18 miles long by 13 wide, but its population numbers only 1300; and Apaiang, with the same number of inhabitants, is 16 miles long by 5 wide. South of the equator lie Nonuti, or Sydenham atoll, 20 miles long by 8 broad; Taputevea, or Drummond atoll, 30 miles long, with a population of 7000; Peru, or Francis atoll; Onatoa, 12 miles long, and other smaller islands. A short note on Nauru, or Pleasant Island, appeared in vol. vi. p. 496.

MISCELLANEOUS.

The French have formally annexed the island of **Kerguelen**.

Captain Grombtchevski is preparing for another expedition in Central Asia.

Mr F. C. Jackson is forming an Arctic expedition. It is his intention to make for the **North Pole** by Franz Josef Land.

The Nyassaland districts, which were on May 14th, 1891, declared to be under British protection, will henceforth be officially described as the **British Central Africa Protectorate**.

The Colonies and India, Feb. 18th, announces that Sir Thomas Elder has offered to equip another expedition for **Australian exploration**.

The variations of level of the **Mississippi**, as shown by the reports of the Mississippi River Commission, far exceed those of any European stream. In the spring of 1891 the water rose to a height of 52½ feet, whereas in the dry season the depth was only a little over 4 feet.

Mr. Cyrus C. Adams, of the New York *Sun*, has contributed an article on **Railroad Development in Africa** to the *Engineering Magazine*. The progress of the railways has been reported from time to time in the *S.G.M.*, but in this article the information is given in a collected and detailed form.

Monsieur de Brettes has accomplished a journey of more than 1200 miles in the province of Magdalena, Colombia. He crossed one of the ranges of the Sierra Nevada at a height of 17,090 feet, and penetrated to a district on the Rio Frio where no European, not even the Spanish conquerors, had ever been before.—*Revue de Géographie*, Feb. 1893.

Kustanai is a new Russian city, situated in one of the most desolate points of Northern Siberia, on the banks of the river Tobol. It has been founded by emigrants from the central Governments of Russia, and now contains 20,000 inhabitants. It is well situated for a commercial centre, and as a hunting station.—*Boll. della Soc. Geogr. Italiana*, December 1892.

A useful little pamphlet has been compiled by our Hon. Corr. Member, Mr. Jackson of Paris, giving the **velocities** of various objects and of divers forms of molecular vibration in mètres per second. Among those of geographical interest are the velocities of a river, when depositing gravel of different degrees of coarseness, of waves, winds, earthquake shocks, etc.

An enormous dyke has just been constructed about 40 or 50 miles north of **Bombay**, across the valley of the Taunsa. It is nearly 2 miles long and 118 feet high. An artificial lake, about $7\frac{3}{4}$ square miles in area, has thus been formed, from which more than 15 million cubic feet of water can be delivered daily in Bombay. —*La Geografia per Tutti*, Feb. 15th.

The *Mouvement Géogr.*, No. 1, publishes a sketch map of the **rapids** which obstruct the **Congo** in the section extending for a distance of 17 miles from Stanley Falls to the Arab post of Kibonge. It is drawn from a compass traverse of M. Page, a member of the Hodister expedition. There are three series of rapids very difficult and troublesome to navigate, viz., at Mandombe, Mamanga, and Basundu.

Thanks to the **Atélier de Sondages du Sud Constantinois**, says *L'Afrique*, March 1893, the route from Biskra to Tuggurt will soon be transformed into a beautiful avenue of palms. The first boring has been executed at El Haush in the country of the Ulad Sidi-Salah, 34 miles to the south-east of Biskra, and $10\frac{1}{2}$ miles from the route between that town and Tuggurt. Here, at a depth of 180 feet, a subterranean reservoir was tapped which yielded 83 gallons of pure fresh water per minute.

The tenth **German Geographical Congress** will meet this year in Stuttgart on April 5th, 6th, and 7th. The principal subjects of discussion will be—(1) Topography of Würtemberg, and the present state of the Exploration of the Lake of Constance; (2) Recent Investigations in the field of Geography, particularly with relation to the formation of deserts; (3) Cartography—General Map of the World; (4) Industrial Geography, and the Practical Application of Geographical Results; and (5) School Geography.

All who wish to take part in the Congress are requested to send in their names as soon as possible to Professor Lampert, Archivstrasse 3, Stuttgart.

We have received an early proof of the prospectus of the **Summer School of Art and Science**, which, under the superintendence of Professor Geddes, is yearly progressing in usefulness. This year a general Consultative Committee has been formed, consisting of the Lord Provost, professors of Edinburgh, Glasgow, and Dublin Universities, and other gentlemen connected with educational institutions. There will be two general courses, one of twenty lectures on Contemporary Social Evolution delivered by Professor Geddes, and another on the History and Principles of the Sciences, in which Dr. Charles Douglas, Mr. J. Arthur Thomson, Mr. Norman Wyld, and Professor Cargill C. Knott will give their assistance. In the section of Education, Social Science and Humanities, M. Paul Desjardins will lecture on *La Renaissance Morale de la France*, M. Edmond Demolins on *La Science Sociale*, and Mr. Victor Branford on Modern History. Professor Geddes will treat of Practical Economics, Mrs. Newcomb will illustrate Modern Educational Methods, and Miss Etka Glyn will give lessons on Elocution. The section will also include a course of Sloyd Instruction, Decorative Work, Literary and Musical Recitals, etc. The Section of Natural Science will consist of lectures by Professor C. Lloyd Morgan on Psychology, by Dr Louis Irvine on Hygiene, by Messrs. Thomson and Wyld on Biology; and in Practical Botany, Zoology, and Geology, Mr Robert Turnbull and Miss Marion Newbigin will co-operate, while Miss Johnston will give instruction in the Preparation of Oil Paintings and Water Colour Drawings, illustrative of the landscapes and vegetation of the globe.

Students are requested to send in their names without delay to Mr J. Arthur Thomson at the University Hall, Edinburgh, from whom all information as to details may be obtained. The School will be open from July 31st to August 26th.

NEW BOOKS.

The Ruined Cities of Mashonaland: being a Record of Excavation and Exploration in 1891. By J. Theodore Bent, F.S.A., F.R.G.S. With a Chapter on the Orientation and Mensuration of the Temples, by R. M. W. Swan. Longmans, Green, and Co., 1892. Pp. xi + 376. *Price* 18*s*.

Before the last great problems of African geography were solved, a new and fascinating archæological mystery was announced from South Africa. In 1871 Mauch first described the massive ruins at Zimbabwe, and the sub-scientific imagination rejoiced to establish the Biblical Ophir in Mashonaland, and to locate King Solomon's mines and the Queen of Sheba's gold factories among its *Kopjes*. Occasional hunters and traders have visited the spot; in August 1890 some of the British South Africa Chartered Company's people took some sketches and photographs (reproduced in Mathers's *Zambesia*, 1891, pp. 20-30). But it was not till the following year that the ruins were regularly explored by an expedition under Mr. J. Theodore Bent, who had proved his skill as an explorer and observer in the Cyclades, accompanied by his wife and Mr. Swan. The work now in question is the result of that expedition; for various reasons it is of quite exceptional interest, and is written in exceptionally entertaining style.

It may be roughly divided into two parts—the one geographical, the other archæological. The first describes the journey from Kimberley through Bechuanaland and the Kalahari Desert, by Vryburg (not Vryberg), Mafeking, Kanya, Molopolole, Shoshong, Palapwe, and so across the Limpopo, by Fort Tuli to Fort Victoria and Zimbabwe—a journey continued, after the two months' work in excavating and measuring, by a zig-zag route through less known country, past a series of ruins more or less like Zimbabwe, to Fort Salisbury and the old gold workings on the Mazoe river; then through the unknown Mtoko's country, and afterwards by the straightest track through Manicaland to Beira at the mouth of the Pungwe river. All along this route, but especially in the regions heretofore little known, the country, its inhabitants, their manners, beliefs, and industries, are described in graphic detail, and illustrated by photographs and sketches; and two appendices by Mr. Swan give valuable geographical, meteorological, and astronomical notes and observations.

In the archæological part the work seems to give as full and lucid descriptions of the remarkable buildings at Zimbabwe—both the great circular ruin near the hill and the fortress-temple on the summit—as could be desired, with plans and illustrations that leave a vivid impression of the size and immense strength of the buildings, the extraordinary complication of their arrangement, and the labyrinthine nature of the passages. The presumable uses of the various parts—altars, gold-working chambers, etc.—are carefully discussed; Mr. Swan in a special chapter almost overwhelms us with mathematical measurements and proportions bearing on the probable use of the building and its various openings for making astronomical and religious observations of the sun and stars. The various finds are described and beautifully pictured, comprising chiefly phallic emblems, large birds on pedestals carved out of soapstone, and parts of bowls graven with bulls, hippopotami, and zebras, besides a few tools and weapons. Here we are left in doubt whether Mr. Bent discusses only the finds made by himself, or includes, for example, those made by Mr. Poselt in 1890, and deposited by him in the South African Museum. To judge by the picture in Mathers's *Zambesia*, the bird, and the knobby, cheese-shaped stone found by Mr. Poselt, are exactly like those figured by Mr. Bent. After the examination of the finds, ancient history is ransacked to support Mr. Bent's

contention that these strange buildings were erected before the Sabæo-Himyaritic period by Arabians, who had intruded thus far amongst alien and partly enslaved but hostile peoples in search of gold, secured in large quantities, and destined ultimately for the Egyptian, Phœnician, and other markets.

Of the interest and value of it all there can be no question. The evidence for the theory propounded is naturally rather of a cumulative kind than strictly cogent in conclusiveness ; the explanation given may be said to be the most probable suggested or imaginable. It may seem to some that in seeking parallels and arguments, Mr. Bent has thrown his net rather wide ; Euthymius Zigabenus and Maximus of Tyre on Phœnician religion, Gideon and the Midianite Penuel (even if it was a phallic tower), and Lucian *De Deâ Syriâ*, are not very convincing authorities as to South Arabian beliefs. How should the resemblance of one of the objects found at Zimbabwe to the long-winged Egyptian vulture "suggest a distinct *Semitic* influence" (p. 157) ? Is it certain that "the early Arab cult was closely bound up with that of Egypt, Assyria, and Phœnicia" (p. 155) ? And surely Mr. Bent is a little too confident when, from the cut of their countenances, he says of the Makalanga, "there is certainly a Semitic drop of blood in their veins."

Before taking leave of this fascinating book, let us say that Mr. Bent has adduced ample grounds for rejecting, in favour of the Arabian origin of Zimbabwe, the view he maintained at the Royal Geographical Society before he left England : that they did *not* resemble Phœnician ruins, but were more likely Persian of the Sassanian period, possibly of the date of Chosroes II.

Le Nil, le Soudan, l'Egypt. Par A. Chélu, ancien Ingénieur-en-ch Soudan égyptien, Membre de la Société des Ingénieurs Civils de France. Paris : Librairie Chaix, 1891.

The author of this work is a French civil engineer who, in 1876-1877, during the days of progress under Ismail Pasha, was employed in studying projects for railways between Khartum and Wady Halfa. He also had experience in setting up pumping machinery in the Delta under the Domaines Administration, and since the events of 1882 has been employed in the Accounts Branch of the Finance Department. Hence his book on the Nile above Aswân and on the commerce of the Eastern and Western Soudan is valuable, as much of the information is first-hand. His connection with the Domaines Administration makes his statistics on agriculture in chapter vii. authoritative from the point of view of a great land-owner.

In the chapter relating to the irrigation of Egypt proper, M. Chélu has obtained his statistics by personal inquiry from the English engineers who have had the control of that department since 1883 ; and, with the exception of a few errors of a technical nature, this part of the work is very full, and gives a thoroughly reliable *résumé* of the progress of irrigation up to 1890. It must, however, be noticed that he has not succeeded in getting much information on the actual cost of irrigation by steam pumps.

The author has brought together in a readily accessible form the somewhat meagre statistics of the discharges of the Blue and White Niles, and of the difference in the deposits brought down by these two widely-differing branches of the great river. He also summarises the remarkable series of projects drawn up by M. Prompt, the French member of the Board of the Egyptian Railways. These projects (p. 161) have for their primary object the improvement of the navigation of the Nile by constructing crests on each rapid, so as to drown the rocks of the rapid and provide a lock for navigation. He, however, does not criticise M. Prompt's estimate of cost, which is manifestly too low. M. Prompt incidentally includes a large weir

at Kalabshah, about forty miles above Aswân. This weir is to be fifteen mètres high, without under-sluices, and will hold up 1500 million cubic mètres of water, for the improvement of summer irrigation.

M. Prompt calculates that the sale of this water will go far in paying the interest on his project. The irrigation engineers in Egypt, however, cannot avoid seeing that the river above the dam will speedily silt up, and thus destroy the containing power of the reservoir, unless the floods are allowed to pass under the dam and not over it. This, of course, would add enormously to the expense.

M. Chélu, in his appendix, gives textually various official papers concerning the regulation of steam pumps, canal law, and the clearance and maintenance of the canals on which Egypt depends for her very life.

In the first chapter he deals very clearly with the enormous evaporation from the Victoria Nyanza, and shows how little this great lake delivers to the Nile flood. He also shows how much Egypt is indebted to the great lakes for her summer supply. From this, one may deduce the great injury that would be inflicted on Egypt were a civilised Power to erect dams at the exit of the lakes so as to shut off the summer supply altogether.

The very detailed description of the river above Gondokoro shows how impossible it would be to use the Nile as a navigable connection between Uganda and the Mediterranean. These points have not been sufficiently dwelt on in the recent discussions on Uganda.

The only really great error made in the book is in the diagram of the Fayûm; and here the author errs in good company, for he adopts without criticism the section of Linant Pasha, on page 382, in which the great French engineer founds his theory of Lake Mœris on an error of 11·80 metres, or over thirty-eight feet! Probably M. Chélu did not like to attack his great compatriot.

The book is well printed and contains good maps, but it has no continuous map of the Nile from Aswân to Cairo. The spellings of Arabic names vary in a way that must bewilder a philologist; but engineers, and especially French ones, are never careful in the matter of the transliteration of names from Eastern tongues. On the whole, the book will be found worth reading by those who wish to have statistics of Egypt and the Soudan in an easily accessible form.

The Fayûm and Lake Mœris. By Major R. H. Brown, R.E., Inspector-General of Irrigation, Upper Egypt. With a Prefatory Note by Sir Colin Scott-Moncrieff, K.C.M.G., C.S.I., and Illustrations from photographs by the Author. London: E. Stanford, 1892. Pp. viii + 110.

The sequestered, old-world province of El Fayûm, lying off the beaten track of the Nile tourist, is a happy hunting-ground for the theorist in archæology, history, and geography. The problems of the limits of the Arsinoite Nome, the site of Crocodilopolis, of the Labyrinth, and of the great pyramids, described by Herodotus as rising out of the waters to a height of a hundred fathoms from their base, have exercised the ingenuity of generations of travellers and Egyptologists. But chiefly the will-o'-the-wisp of the ancient Lake Mœris has kindled the curiosity of visitors to the Fayûm, and has led many of them a wild dance, ending in bog or quicksand, in an attempt to reconcile the statements of the early writers with the physical features of the province to-day. It is refreshing to take up a volume like that of Major Brown, in which the facts and conditions of the problem are stated in clear, precise, and simple language, and in which solution is sought by using at every step the implements and methods of the hydrographical engineer. The author by no means shrinks from putting forward hypothetical suggestions regarding Lake Mœris and the condition of the Fayûm in prehistoric and in early historic times;

he has a hypothesis to sustain which, if it is not original, is here more definitely laid down and more strongly buttressed with scientific facts and arguments than in any previous treatise on the subject. But whether or not acceptance be ultimately accorded to his theory of the position, limits, and functions of the great lake, which, according to the classical writers, regulated the Nile inundations and the distribution of the fertilising waters in Lower Egypt, it will be generally acknowledged that Major Brown's surveys and measurements, and his careful application of these to the former and the present circumstances of the Fayûm depression, have cleared a vast amount of ground in an obscure region of geography and history. M. Linant de Bellefonds' theory, which placed Lake Mœris just within the gap in the hills by which the Bahr Yûsuf, the feeder and drainer of the ancient Nome, enters the Fayûm, and assumed that the cultivated lands of the province of the Pharaohs were interposed between it and the Birket-el-Qurûn towards the west, is demolished when subjected to Major Brown's measurements and analyses. It is found to agree neither with the descriptions of the old authors nor with the levels of the surface of the Fayûm in our own or at any former time; and it supposes, among other things, that the inhabitants of the old province lived under the perpetual terror of having a huge body of water suspended above them, and kept from rushing down to the lower level of the Qurûn lake by a weak retaining bank. Major Brown, on the other hand, holds that the Birket-el-Qurûn, the water surface of which was, in January 1892, 43½ metres below the level of the Mediterranean, is the remains of the ancient Mœris, which in the time of Herodotus must have covered the greater part of the area now occupied by the cultivated lands of the Fayûm. Acceptance of this view necessarily limits in an important degree the extent of the Arsinoite Nome, which, by the author's calculations, could hardly have exceeded one-tenth of the ground included in the modern province. The difficulties arising from this and other points involved in the theory are boldly tackled; and even those who are not prepared to fully indorse all the author's conclusions will admit that he has made out a strong case. The future, as well as the past and the present, of the Fayûm engages Major Brown's attention, and he discusses, in the light afforded by his investigations, the projects that have been broached for once more turning the Fayûm, or rather the adjoining depression of the Wadi Raian, with which Mr. Cope Whitehouse has so perseveringly occupied himself, to the ancient purposes as a reservoir for the control of the Nile floods and as a storage basin for supplementing a low Nile. The book is handsomely illustrated with plates from photographs taken on the spot by the author, and by maps, cross sections, ground plans, and diagrams prepared by him, or of interest in explaining the views and researches of previous investigators. It is a real contribution to knowledge, and an earnest of the excellent work that is being done by the English officers of the Irrigation Department.

The Lost Atlantis, and other Ethnographic Studies. By Sir Daniel Wilson, LL.D., F.R.S.E. Edinburgh: David Douglas, 1892.

The primary interest of the papers contained in Sir Daniel Wilson's posthumous volume is ethnographical and archæological rather than geographical. But they touch at many points on problems of historical geography which have engaged, and are likely to engage for a long time to come, the attention and research of men of science. Among these are the questions—of peculiar interest at a time when the fifteenth century discovery is being commemorated—relating to the pre-Columbian intercourse between Europe and America. The legend of the "Lost Atlantis" and the story of the discovery of "Vinland the Good" by the Northmen are the subjects

of the first two essays. No man was better qualified, from his antecedents, his pursuits, his intellectual bent, to treat these vexed questions in a luminous and fair-minded and yet popular style than the venerable Principal of Toronto University, who was himself in a sense a link between the Old World and the New. The book derives additional title to respect from the fact that it represents the ripest fruit of his studies of the primeval wanderings of man, of the geography as well as the arts of prehistoric times. As his daughter tells us in a touching preface, the correction of the proofs of what he described as "a few carefully studied monographs linked together by a slender thread of ethnographic relationship" occupied his last hours and his failing strength. But on their own account they will be gladly welcomed and widely read. They exhibit the author's charm of style as well as his erudition, his accuracy and judgment, and his analytic and synthetic power in dealing with all questions of ethnographical fact and speculation brought under his notice. He recognises that the materials upon which any opinion can be formed respecting the route by which population and arts originally found their way from the Old World to the New are curious and suggestive rather than conclusive. Certain shadowy landmarks or guiding posts may be discovered, in ancient legend and folk-lore, in early writings, and in the indications afforded by affinities of arts, languages, and racial characteristics. But there still remains, as the prize of some Columbus in ethnography, the discovery of some "indubitable memorial" proving to demonstration that Phœnician, Egyptian, or Greek voyagers crossed the Atlantic and left the impress of their presence on Maya and Aztec civilisation, if they were not the founders of these New World empires; or that the visits of the Icelandic rovers to the shores of Labrador, Nova Scotia, and New England, and their colonising of Markland and Vinland, rest on authentic fact (as present information leads us to suppose), instead of being mere products of the vivid imagination of the Saga-makers. The paper on "Trade and Commerce in the Stone Age" is instructive as illustrating the fact that in the Western Continent, as in ancient Europe, Asia and Africa, the prehistoric routes of commerce and intercourse were in large part "determined by the geographical contour of the regions through which they pass;" and that co-operation and division of labour in the industrial arts and a recognised currency and medium of exchange had their origin far back in palæolithic times, and were probably coëval with the beginnings of early trade and manufacture. In prehistoric America, as in primitive Europe, the principles of barter and sale, the accumulation of capital in *caches*, the centralisation of labour at convenient and favourable spots, and the march of nations and the transport of goods and stock by well-recognised routes, recommended by physical or strategical considerations, were carefully observed while there was yet no higher representative of wealth or product of skill than the flint flake. The other papers in the volume, on "Pre-Aryan American Man," "The Æsthetic Faculty in Aboriginal Races," "The Huron-Iroquois," regarded as a typical North American people, "Hybridity and Heredity," and "Relative Racial Brain Weight and Size," deal with cognate subjects, which are, however, of more specific and engrossing interest to the science of ethnology than to that of geography.

A Brief History of the Indian Peoples. By Sir William Hunter, K.C.S.I., C.I.E., M.A. Oxon., LL.D. Cambridge. Twentieth Edition, Revised. Seventy-eighth Thousand. Oxford: The Clarendon Press, 1892. Pp. 254. *Price* 3*s.* 6*d.*

India is fortunate in having for her historian Sir William Hunter, who, besides being in deep sympathy with her people, has a vast, varied, and accurate knowledge of Indian affairs, and is at the same time one of the most brilliant and attractive

writers of the day. He is to be congratulated on the success of the work before us, which in less than eleven years has reached a twentieth edition and been translated into five different languages. He here presents us, from original sources, but without discussion, since he has carefully examined them in his larger work, a concise and true history of the races by which India is peopled. The small volume is beyond question the best manual we possess of Indian history. It is a vast improvement on the short histories of India formerly in vogue, which treated chiefly of wars and the rise and fall of dynasties, and which, after a few remarks on ancient India, ending with a notice of the Macedonian invasion, proceeded at once to modern times, thus leaving blank a period of no less than twelve or thirteen centuries. Sir William, on the other hand, devotes nearly a half of his work to the early period, and this will be found its most profitable and interesting section. A very useful feature of the volume is that to each chapter a list of works for reference is appended. This twentieth edition embodies the latest results of Indian historical research, and includes also the principal figures arrived at by the census of 1891. We trust it will find its way into many of our schools and colleges.

The Tuscan Republics, with Genoa. The Story of the Nations Series. By Bella Duffy. London: T. Fisher Unwin, 1892. Pp. xix + 456. *Price* 5*s*.

It is perhaps doubtful whether the story of these republics should form part of the series in which it appears. But that it is worth telling within moderate compass is much more certain. For in a way the subject is unique. "Taken altogether, there are no more instructive examples of self-help and self-destruction, of rapid rise and complete extinction, than are afforded by the Commonwealths which for five hundred years controlled the destinies of Tuscany and Liguria." Genoa is added to the Tuscan towns, Florence, Siena, Pisa, and Lucca, owing chiefly to its close rivalry with Pisa. The task can have been no easy one: the interests were so varied both of peace and of war; manifold the intrigues in source, career, and issue; rapid and sometimes bewildering the fluctuations. But the task, though difficult, has been encountered with much success. The many threads are well kept in hand, and, if a lack of continuity is noticeable, for this the subject more than its expounder is responsible. The interest of the theme is contained in rises and falls, in incidents rather than in any consistent or well-defined policy. Yet such unity as might have been found has now and again been ignored: thus, the balance-of-power policy of the Medici, till the death of Lorenzo in 1492, is hardly realised, certainly not in proper perspective. The treatment of affairs during the interesting period almost synchronous with Machiavelli's active life is inadequate. A too slender grasp of constitutional change is balanced by clear accounts of matters of interest in literature and art (for which the scope is ample), and of systems and undertakings in commerce and finance. Maps, very interesting and well-executed views and illustrations, and a chronological summary add to the value of the book. The absence of genealogical trees will be felt by all but the specialist.

Rivers of Great Britain: Rivers of the East Coast. Descriptive, Historical, Pictorial. London: Cassell and Co., 1892. Pp. 376. *Price* 16*s*.

In this handsome and beautifully illustrated volume we find well-written descriptions of the Highland Dee, the Tay, the Forth, the Tweed, the Coquet, the Tyne, the Wear, the Tees, the Humber and its tributaries, the rivers of the Wash, and the rivers of East Anglia—in fact, all the celebrated rivers of the East Coast with the exception of the Spey and the Thames. There is an excellent index to

the work. Mr. John Geddie describes the Tay, Forth, and Wear; Mr. Francis Watt the Highland Dee; and Mr. W. W. Hutchings the Tweed. As a specimen of the writing, we may quote Mr. Geddie's opening paragraph on the Tay:—

"'Behold the Tiber!' said the conquering Roman, when, from one of the many 'vantage-grounds commanding the noble stream that sweeps past Perth, the Imperial eagles first saw as fair a scene as they had yet reached in their flight. The ardent lovers of the river—meaning all who know its banks well—have ever since felt, with Scott, half-flattered by the traditional compliment, half-scornful of the comparison of the puny and 'drumlie' Roman stream with the broad, clear, and brimming Tay—the dusty Campus Martius with the green 'Inches' of Perth—the featureless and desolate Campagna with the glorious stretch of hill and plain, water and woodland, overlooked from Kinnoull Hill or the 'Wicks of Baiglie.'"

The Highlands of Central India. Notes on their Forests and Wild Tribes, Natural History, and Sports. By Captain J. Forsyth, B.S.C. New Edition. London: Chapman and Hall, Limited, 1892. Pp. xi. + 475. *Price* 12*s.*

We welcome this new edition of an old favourite, and are glad to think that it is still in demand. Several good books on sport in India have been published since it first saw the light, but none is characterised by more attractive qualities than this of Captain Forsyth's on the Highlands of Central India. Whether he is describing the scenery, the natural history, or the character and customs of the simple aboriginal tribes, or telling the exciting story of his encounters with the wild beasts that haunt the jungles, he never fails to interest and charm the reader. If any one has the opportunity of wandering through the country, the attractions of which Captain Forsyth was almost the first to reveal to the world, he will find, as others have found, this book to be a most pleasant companion, and will assuredly share the regret that its author was cut off at so early an age.

The Realm of the Habsburgs. By Sidney Whitman. London: William Heinemann, 1893. Pp. viii + 310.

The author of this work is already known by a critical study of Germany. The present work contains much that is interesting, and from first page to last is eminently readable, although the style and a great part of the matter are more in keeping with magazine literature than with the higher demands of a book. We are shown a full and well-diversified picture vividly presented: the Austria of to-day, racial, social, economic, religious (or, say, ecclesiastical), political, military, is brought within clear view. Austria, says the author in a suggestive passage, "is a country which stands geographically, economically, as well as politically, midway between the past and the present. Geographically Austria, on the west, borders on highly developed Germany, while on the east it touches stagnation. In parts of Austria the past in all its phases is still blended with the present in proportions hardly to be met with elsewhere in Europe." In Austria-Hungary we are supplied with a transition stage between Western and Eastern civilisation. "Discipline" is regarded by Mr. Whitman as lacking in Austria, though very essential throughout the Empire. Although some thin philosophising, far too much journalistic phrasing, and many forms of expression of mixed origin deface its pages, the volume has been carefully compiled, and should be useful to all.

Uganda. By Philo-Africanus. Reprinted from the *Imperial and Asiatic Quarterly Review*, January 1893.

The writer belongs to the non-intervention school. His object in writing on the subject is not to look at it as a missionary or a commercial question, but as

a national one. He strives throughout to maintain a cold, judicial attitude, but his sympathies cannot be concealed from first to last. He first marshals all the arguments which have been put forward by the advocates for the retention of Uganda under fifteen heads, and then bowls them over to his own satisfaction like so many ninepins. He recognises that this Uganda question is one of the gravest problems of the century, and urges that it be thought out on its merits. The real question is this—not simply as it relates to Uganda, but to Britain's work in Africa —whether in that continent the powers of evil or the powers which work for righteousness are to be permitted to reign supreme? The advocates of retention believe that we have a faculty for good, for opening up new countries, for settling new territories, for developing their resources, for understanding native races, and for evolving order out of chaos. With this view of Britain's mission Philo-Africanus has no sympathy. He writes with ability and knowledge, and exposes the errors and ignorance of some of those who have spoken with more zeal than wisdom on behalf of the retention of Uganda.

Aufstand und Reich des Mahdi im Sudan, und meine zehnjährige Gefangenschaft dortselbst. Von Josef Ohrwalder, apostolischem Missionär. Innsbruck: Carl Rauch's Buchhandlung, Heinrich Schwick, 1892. Pp. 320. Map and Portrait.

This book, of which an English edition has been published, contains the only authentic account of the Mahdi's rebellion in the Sudan, and the condition of that country up to the beginning of December 1891, when the missionary, accompanied by two sisters, arrived in Cairo after an adventurous flight from the Mahdi's camp. The author belonged to the Austrian Mission, and he and his companions were taken prisoners and underwent the most intolerable hardships for no less than ten years. The account of their sufferings and the straits to which they were brought to obtain the bare necessities of life forms a thrilling record of heroic patience, one which has hardly been surpassed at any time. The account of the Mahdi's government is of extreme interest, and the description of the annihilation of Hicks Pasha's force and of the siege and fall of El Obeid is graphic. We have in this volume a detailed and trustworthy account of the siege and fall of Khartum, of Gordon's last days, and of the frightful massacre which occurred when the Mahdi's hordes gained entrance to the town. The book is written with a simplicity which should carry conviction of the accuracy of its statements to all minds; and it concludes with a strong appeal to the European Powers, and especially to Great Britain, to put an end to the intolerable misery under which the inhabitants of the Sudan are at present suffering, and which was really caused by the action of the Powers. It may be doubted whether this righteous appeal will find an ear in these days, but at anyrate no one reading the book with an unprejudiced mind can doubt the duty of this country in the matter.

The volume is not illustrated, and the publisher's explanation is a good one. He prefers the author's graphic pen to illustrate the subject, and thinks that as he never took a sketch himself, and as all the pictures in the English edition have been produced by the fancy of the artist, they are best omitted– in which we agree with him.

Scotland in Prehistoric Times. By Charles Annandale, M.A., LL.D. London: Blackie and Son, Limited, 1892. Pp. 38, royal 8vo, sewed.

The ancient kingdom of Scotland is a very venerable institution, but the history of the country cannot be said to begin before 80 A.D. and Agricola's

invasion; and at that date most histories commence. Dr. Annandale's booklet is apparently an "off-print" of what he has written as an introduction to the *History of Scotland* by the Rev. Thomas Thomson; and this introduction admirably answers to the description of it on the title-page as "a brief summary of what is known regarding the country and its inhabitants in times anterior to the Roman invasion." Dr. Annandale is even better than his word: he not merely gives us an account of Scotland in the "prehistoric period more strictly so called," but devotes thirteen pages to the pre-prehistoric period, giving a concise but luminous sketch of the physiographical conditions of what is now Scotland in the later geological times. Thereupon follows the civilisation of the stone, bronze, and iron periods, with their relics in arms and arts, the lake dwellings, the anthropological questions that have been raised as to pre-Celtic inhabitants, the Celtic problems, and the most recent phases of the discussion as to who the Picts were. Within the space there could hardly be a more satisfactory compendium of what one must usually seek in many separate works—a compendium of results associated with such names as those of Boyd Dawkins, Wilson, Elton, Joseph Anderson, Evans, Lubbock, Munro, Skene, Rhys, Schrader, Geikie, and Ramsay, who are cited by Dr. Annandale as his authorities.

Five Years' Hunting Adventures in South Africa. By R. Gordon Cumming. London: Simpkin, Marshall, and Co. Glasgow: Thomas D. Morrison, N.D. Pp. 349. Illustrated. *Price* 5*s.*

This "complete popular edition" of a well-known work will be welcomed by lovers of sport and adventure. Many hunters have visited Southern Africa since the days of Mr. Gordon Cumming, and game does not now roam the more accessible plains in such large numbers as it did forty years ago; but those who are prepared to journey far enough in quest of sport will always find this book an invaluable guide to the chase of the lion, the elephant, and other *feræ naturæ* of these regions.

The Earth and the Solar System. Together with Chapters on Latitude and Longitude, Tides, Currents, Winds, and Climate. By Thomas Page. Thirteenth Edition. London: Moffatt and Paige, N.D. Pp. 64. *Price* 1*s.*

This little book contains a brief but clear statement of the elementary facts usually included under the term "Physical Geography." It is specially adapted to the requirements of pupil-teachers under the Education Code, and those who master its precise and formal paragraphs should have little difficulty in passing the examinations of the Department. The fact that the book has reached a thirteenth edition may be accepted as a proof that it has been found to serve its purpose. It is somewhat deficient in diagrams, and some of those given are rather crude.

Handbook to the Uganda Question and proposed East Africa Railway. With Maps. By Ernest L. Bentley. Chapman and Hall, London, 1892. Pp. 62.

British East Africa and Uganda. With Map. Chapman and Hall, London, 1892. Pp. 67.

These books will be of interest fifty years hence, as they give an accurate account of the Uganda Question. It is a pity that the authors did not refer to the older literature on the subject, as, if they had done so, they would have made a more complete record of the country about which they write.

Bibliographie Nationale Suisse. Fascicule IIb.: Cartes de Parcelles plus ou moins grandes du Territoire Suisse. Publié par le Bureau Topographique Fédéral. Rédigé par le Prof. Dr. J. H. GRAF. Berne: K. J. Wyss, 1892. Pp. 173 to 335.

This fascicle is issued in continuation of IIa., which was reviewed in vol. viii. (September), and contains a list of maps classified as political, topographical, hypsometric, orographic, hydrographic, geological, historical, archæological, postal, railway and telegraph, route, statistical, forest, botanical, military, etc.

It forms part of a most valuable book of reference, of which we have again to express our cordial appreciation.

The Canadian Guide-Book. Part II. Western Canada, including the Peninsular and Northern regions of Ontario, the Canadian shores of the Great Lakes, the Lake of the Woods region, Manitoba and the "Great North-West," the Canadian Rocky Mountains and National Park, British Columbia, and Vancouver's Island. By ERNEST INGERSOLL. London: Wm. Heinemann, 1892. Pp. 261. *Price* 6*s.*

A very portable, well arranged, and excellent guide-book, including some really beautiful illustrations from photographs. There are also maps of Ontario, North-Western Canada, and British Columbia.

The Directory for Bangkok and Siam for 1892. London: Frederic Algar. Pp. iii + 334 + 32.

This hand-book contains much information, and the directories to the various Government departments show how thoroughly European methods and systems are being adopted by the executive. Neither printing nor paper are of the best, but, considering all the difficulties which the publishers have had to surmount, the volume being issued from a newspaper office at Bangkok, these faults must not be insisted upon. There is a well-drawn plan of the town included in this edition, and another sheet shows the Royal standards and the flags of the chief steamboat lines trading with the country. Both these sheets are very nicely produced, but are not fastened in to the volume.

The Northern Counties Red-Book and Chronicle Almanack for 1893. Inverness: *Northern Chronicle* Office. Pp. 84. *Price* 3*d.*

When we last noticed this useful little annual (vol. viii. p. 230), we took occasion to point out what were, in our opinion, certain blemishes in an otherwise excellent production. We are glad to see that most of these small faults have been corrected in the present edition; and as the whole contents have been brought thoroughly up to date and carefully revised, the *Red-Book* may be cordially recommended as an excellent hand-book for the Northern Highlands. It is well and clearly printed, and contains a large amount of unpaged matter.

Johnston's Geographical Hand-Books: Sweden, Norway, and Denmark. With Wall Map.

This series is intended for the use of schools. The wall map is very clear and suitable in every way. The Hand-book contains a general description of each country, under various heads, such as position and boundaries, area and population, geographical features, climate and productions, industries, manufactures, commerce, internal communications, history and people; and this is followed by a particular description of each province. The information is concisely put together, and the work will form a most useful class-book.

Madagascar, its Missionaries and Martyrs. By WILLIAM JOHN TOWNSEND, D.D. London : S. W. Partridge and Co. N.D. Pp. 160.

This volume is the best we have seen of the cheap series of popular missionary works to which it belongs. It is more original than some of these, and is carefully written. Beginning with a physical description of Madagascar as the third largest island in the world—980 miles long, 350 across at its broadest part, and four times the size of England and Wales—Dr. Townsend sketches the course of European influence on the Hovas, from the captivity of Robert Drury, the shipwrecked sailor, in 1702, to the recent Anglo-French Convention. Nothing could be better than the historic sketch of the origin, growth, sufferings, and marvellous extension of the Christian Church in the island, under the agents of the London Missionary Society—Jones, Griffiths, and Ellis. The story of the martyrs, repeated more recently in Uganda, is well told. More might have been said of the political and persecuting intrigues by which the French Roman Catholic missionaries seem everywhere to poison their philanthropy. Dr. Townsend, in his physical sketch, does not seem to be aware that all the geological facts point to Africa and India having been parts of one great continent, of which Madagascar is a modern relic. But this is a good popular book.

NEW MAPS.

ASIA.

INDIA, Atlas of ——. Quarter sheets Nos. 11 SE., 22 NE., 35 NW. (with additions to 1889), 39 NE., 105 SE. (with additions to 1891), 130 SE. (with additions to 1890), 131 NE. Full sheets Nos. 40, 42, 74, 114, and 115 (with additions to 1890). Scale 1 : 253,440, or 4 miles to 1 inch.

GENERAL MAPS.

INDIA, Map of ——, showing Feeders to Railways, Roads, and Navigable Canals. 6 sheets. Scale 1 : 2,027,520, or 32 miles to 1 inch.

INDIA, Map of ——, No. 1, with Hills (with additions to Railways up to 1890). Scale 1 : 16,220,160, or 256 miles to 1 inch.

INDIA, Skeleton Map of —— (2d Edition). Scale 1 : 6,082,560, or 96 miles to 1 inch.

INDIA, Map of ——, showing Railways, corrected up to 31st March 1891. Scale 1 : 6,082,560, or 96 miles to 1 inch.

INDIA, Map of ——, in 4 sheets (with additions to Railways 1891). Scale 1 : 4,055,040, or 64 miles to 1 inch.

PROVINCIAL MAPS.

BURMA AND ASSAM FRONTIER, Map of —— (with additions to Boundaries and corrections to Railways to 1891). Scale 1 : 2,027,520, or 32 miles to 1 inch.

ASTOR AND GILGIT, Map of ——, with surrounding country, corrected up to 1883. Scale 1 : 253,440, or 4 miles to 1 inch.

AFGHANISTAN, Map of ——, with Hills (with additions to Railways up to March 1892). Scale 1 : 1,520,640, or 24 miles to 1 inch.

PUNJAB AND SURROUNDING COUNTRIES, Skeleton Map of the —— (with additions and corrections to Railways up to June 1891). Scale 1 : 2,027,520, or 32 miles to 1 inch.

BENGAL PROVINCES, Map of the —— (Eastern and Western). Sheets Nos. 1-13 (with additions and corrections to 1891); No. 14 (with additions and corrections to March 1892); No. 15 (with additions to July 1883); No. 16 (with additions and corrections to 1891). Scale 1 : 506,880, or 8 miles to 1 inch.

BENGAL, BEHAR, ORISSA AND CHOTA NAGPUR, Map of ——, in 2 sections (with additions and corrections to Boundaries to August 1891). Scale 1 : 1,013,760, or 16 miles to 1 inch.

NORTH-WESTERN PROVINCES AND OUDH, Map of the —— (corrected to 31st March 1891). Scale 1 : 2,027,520, or 32 miles to 1 inch.

NORTH-WESTERN PROVINCES AND OUDH, Map of the ——. Scale 1 : 5,068,800, 80 miles to 1 inch.

PUNJAB, Map of the —— (engraved). Scale 1 : 5,068,800, or 80 miles to 1 inch.

CENTRAL PROVINCES, Map of the ——, in 2 sheets (with additions to 1891). Scale 1 : 1,013,760, or 16 miles to 1 inch.

NORTH-WESTERN PROVINCES AND OUDH, Map of the ——, in 4 sheets (3rd Edition), with additions and corrections to March 1891. Scale 1 : 1,013,760, or 16 miles to 1 inch.

BERAR, Map of —— (engraved). Scale 1 : 1,520,640, or 24 miles to 1 inch.

BOMBAY PRESIDENCY, Map of the —— (with corrections and additions to 1891).

RAJPUTANA AGENCY, Map of the —— (with additions and corrections to 1891). Scale 1 : 5,068,800, or 80 miles to 1 inch.

CENTRAL INDIA AGENCY, Map of the —— (with additions and corrections to 1891). Scale 1 : 5,068,800, or 80 miles to 1 inch.

PUNJAB, Road Map of the ——, showing Ferries, Sarais, Dak Bungalows, etc., in 2 sheets (with additions to May 1891). Scale 1 : 1,013,760, or 16 miles to 1 inch.

OXUS, Carte du Bassin de l'Ancien ——. Dressée à l'Echelle de 1 : 5,000,000. Par Edouard Blanc. *Bulletin de la Société de Géographie, 3e Trimestre*, 1892.

OXUS, M. Dauvergne's Route across the Tributaries of the Yarkand River to the Sources of the ——. Scale, 1 : 2,030,000.
Proceedings of the Royal Geographical Society, November 1892.

PAMIR. Carte de la Répartition des Neiges dans les Vallées, par G. Capus. Mars et Avril 1887. 1. Vallées du Mâdi au lac Grand Kara Koul. 2. Vallées du Pamir parcourues par la Mission Bonvalot, Capus et Pépin.
Bulletin de la Société de Géographie, 3e Trimestre, 1892.

KOURDISTAN, Lever dans le ——, par C. de Korab Brzozowski, 1869. Echelle, 1 : 750,000. *Bulletin de la Société de Géographie, 2e Trimestre*, 1892.

KLEINASIEN, Dr. Walther Ruges Reisen und Aufnahmen in ——, 1890. Massstab, 1 : 250,000. Sekt. I., Aufnahme des Ülfertchai, Sept. 1890. Sekt. II., Route von Erdek bis Güredje, Sept. bis Oct. 1890. Sekt. III., Route von Smyrna bis Chios, Oct. 1890. Sekt. IV., Aufnahmen in Chios, Nov. 1890. Übersichtskarte der Reiseroute. *Petermann's Geogr. Mitteilungen, Jahrgang* 1892, *Tafel* 17. *Gotha: Justus Perthes.*

GENERAL.

FREE CHURCH OF SCOTLAND MISSION MAP, 1893. Presented by the Foreign Missions Committee to every Congregation of the Church in Scotland and abroad.

This map is compiled and edited by Dr. George Smith, F.R.G.S., for use at Missionary meetings and in Bible and Sunday-School classes, and is therefore executed in a bold style. The map embraces the greater parts of Europe, Asia, Africa, and Oceania. In a new edition a few improvements might be made. The limits between the Roman Catholics and Protestants in Germany are not correctly delineated. Thuringia, the Kingdom and Province of Saxony (the country of Luther), as well as Northern Silesia, are almost entirely Protestant. The Stundists in Southern Russia, of whose persecution by the Russian authorities we have heard lately so much, might have been indicated. With these few exceptions the map is satisfactory, and will undoubtedly prove very useful for the purpose for which it has been designed. A list of the missionaries from Scotland to the heathens, Mohammedans, and Jews, is also given on the map.

ATLASES.

DEUTSCHER KOLONIAL-ATLAS für den amtlichen Gebrauch in den Schutzgebieten. Nach den neuesten Quellen, mit Verwendung von kartographischem und sonstigem bisher noch nicht veröffentlichtem Material der Kolonial Abteilung des Auswärtigen Amts und der Neu-Guinea-Compagnie, bearbeitet von Dr. Richard Kiepert. Begleitender Text von Professor Dr. Joseph Partsch, 1893.
Berlin: Dietrich Reimer.

Dr. Richard Kiepert's Colonial Atlas is specially prepared for the German Colonial Department at home, and for German officials abroad, but it will be very useful to every one interested in enterprise in these Colonies. All available data have been placed at the disposal of the author, and we have therefore a work before us which is based on the best and most reliable information. The Atlas contains five large sheets which, folded together, form a handsome volume. The first of these sheets is a general map of the world on Mercator's Projection, showing the position of the German Colonies, the mail steamer routes, and the posts of German representatives. Three maps are devoted to the German possessions in Africa, and two to the German Protectorate in the Pacific, all on the scale 1 : 3,000,000. The letterpress which accompanies the maps is divided into two parts; the one written by Professor Partsch deals with the history of the acquisition of the German Colonies, with the land-surface features, the climate, ethnology, exports and imports, while the other, written by Dr. Kiepert, gives an account of the compilation and construction of the maps. A copious index is given to each map.

SCHWEIZ, Topographischer Atlas der ——, in Massstab der Original-Aufnahmen nach dem Bundesgesetze vom 18 Dezember 1868 durch das eidgen. topogr. Bureau gemäss den Direktionen von Oberst Siegfried veröffentlicht.

Lieferung XLI. :—

No. 246bis, Schübelbach.	No. 301, La Sarraz.	No. 446, Coppet.
„ 293, Yverdon.	„ 355bis, Stockhorn.	„ 457, Dent le Lys.
„ 295, Chavornay.	„ 373, Entlebuch.	„ 487, Vissoye.
„ 294, Le Lieu.	„ 375, Schimberg.	„ 496, Visp.

THE SCOTTISH
GEOGRAPHICAL
MAGAZINE.

THE PEOPLES AND COMMERCIAL PROSPECTS OF THE ZAMBESI BASIN.

By Daniel J. Rankin, F.R.S.G.S., M.R.A.S.

(*Read at Meetings of the Society in Edinburgh, Dundee, and Aberdeen, April* 1893.)

The Peoples.

It is difficult, or almost impossible, to give even an approximate estimate of the native population of the Zambesi basin. The Portuguese, in their towns, have never made even the roughest census. The people on the lower river are almost exclusively migratory, going from one *prazo* to another, according as the owner of the *prazo* or estate pleases them or not; and it is only on the waterways that one finds people settled in any numbers.

In the vast tracts on the watersheds between the rivers and streams one may go for miles without encountering a single human habitation, for the art of procuring water from wells is entirely unknown to the native, except, perhaps, by a small hole dug in the neighbourhood of a spongy depression. In rough figures, I should myself calculate that between the Loangwa river and the coast the population numbers little over a million, with perhaps twice as many on the upper waters of the Zambesi.

I should estimate the population in the Shiré valley, including the Nyassa highlands, as being between two and three hundred thousand, though all figures of this nature are essentially crude and inaccurate, as they are based on no reliable data. There is, however, no gainsaying the fact that the country, taken as a whole, is not by any means thickly populated.

The alien population consists of about two hundred Portuguese, of whom there are about fifty of European blood, the remainder being subjects of Portuguese India; seventy or eighty British, mostly Scotch;

and about three hundred British Indian subjects. About fifty comprise Germans, French, Swiss, Dutch, Poles, Italians, and other Europeans. It will thus be seen that the alien British element exceeds in number even that of the Portuguese.

The Portuguese can be divided into three distinct classes—military officials, traders, and convicts. The Province having been made a penal settlement, few of the best officers are willing to accept any post in the colony, and the minor appointments are mostly filled up by those whose past official career will not bear a very searching scrutiny, most of them being men of little education and occupying the lowest ranks in the home service. They fill the office of *Commandante Militar*, having under them a small body numbering ten or twenty Angola Negroes, and they nominally govern considerable tracts of country in the vicinity of their stations in a manner that forms a grotesque caricature of civilised administration. The officers selected for these posts from the Indian forces are, as a general rule, considerably superior to their European *confrères*, being selected from a better class of men and possessing more intelligence and appreciation of the demands of their position.

Many of the higher officials have shown themselves well worthy of their onerous posts, but in the majority of cases have found that the innovating policy of reform and progress has brought upon them the antagonism of the mass of ignorance and stagnation that unfortunately predominates amongst the convicts and semi-convicts who form the majority of the colonists, so that they have perforce given up their work in despair; though in some instances—notably that of Captain Castilho—not without leaving behind them permanent results of their civilising and progressive policy. The officer referred to, when Governor-General of the Province, initiated a system of telegraphs that now almost covers the lower Zambesi valley; and it is not unworthy of comment that in this the Portuguese are far in advance of our own Protectorate, where there is not a single mile of telegraph communication nor any other improvement on the means of communication existing amongst the earliest settlers.

The attitude of the petty officials towards the development of the country is entirely one of antagonism. They know nothing of trade or commerce and less of administration; their idea of fulfilling their responsible duties resolves itself into superintending the evolutions of a dozen ill-armed Negroes and terrorising the unfortunate peasants in the neighbourhood.

One I saw last year—an officer of European birth, possibly transported there for no creditable conduct—had obtained a holiday, and was journeying from his post on the Shiré to Mopea in a native dug-out, surrounded by native women and in a state of gross intoxication at five in the morning, firing at random without intermission on the banks from an antique Snider, greatly to the peril of those on shore and little to the credit and dignity of Portuguese officials. Of some other *Commandantes* I can, however, only speak in favour, especially of the *Commandante* of the Chinde, Senhor Magalhães, from whom I have always received the greatest hospitality and kindness, as, indeed, invariably from the Governor-General of the Province and the Governor and officials of Tete.

The ideas and ignorance of outside affairs displayed by the minor officials are often extremely grotesque. Coming down the Zambesi in 1891, during the time in which the relations between Britain and Portugal were rather strained, I came across one of these *Commandantes Militares* in an up-country station a hundred miles away from any other European. I invited him to dinner. He, however, sent his serjeant down saying he was unable to accept my invitation for fear of bringing on an international complication.

While Portugal continues to make this rich region her social refuse-heap, she need scarcely be astonished that its resources are undeveloped; and, instead of being a second Brazil, has an annual deficit in its revenue which has to be supplied by the impoverished home exchequer.

The Portuguese merchants and traders, especially in the inland settlements such as Tete and Sena, are mostly of Goanese extraction, only one or two being Europeans.

As a body, they complain bitterly of the restrictions and obstacles placed in their way by the local Government, whose whole policy, indeed, is in the highest degree inimical to the commercial development of the colony. Now, however, that it has given up a vast area of territory on the Zambesi into the hands of companies, it is to be hoped that a new era has dawned on this rich and ill-governed region, and that, instead of being administered by subalterns and irresponsible petty officers, its vast resources will be adequately developed by those having a knowledge of commerce and finance.

The great characteristic of the Goanese merchants, especially in Tete, is the genuine hospitality and kindness they invariably show to new-comers, no matter of what nationality. This is the case, too, with the higher officials, though many of them are restrained from carrying out their hospitable desires by reason of the suspicion and ill-feeling such actions would arouse among the ignorant mass of the convict population.

Of the convicts themselves there is little to be said, except that their presence in the colony has been one of the chief causes of its past insolvency. A number of them, however, have under their new conditions of life abandoned their old career of crime and turned out industrious and reputable citizens. Having received permission to enter into trade, they have succeeded in amassing considerable wealth, and in some instances have been in a position to assist the Government pecuniarily, and at least on one occasion to my knowledge have been rewarded with an order called the order of Jesus Christ—rather an anomalous investiture, when we consider it is conferred on a convict during his term of imprisonment.

Of the lower class of convicts a few turn out well; but the majority, owning small drinking hells, where the worst forms of spirits are retailed to the natives, have sunk to a depth of grossness and vice far beneath that of the most debauched savage.

Between these and the indigenous people there is a class strictly called Muzungus. They are Negroes, with a more or less perceptible quantity of alien blood, either convict or Goanese. The females of this class are, as a rule, lighter in colour, and supply wives and concubines for both Portuguese subjects and Europeans.

The half-caste daughters of the old *prazo* owners are styled *Donas* or ladies, and some of them have inherited fortunes more or less considerable from their white parents. Many of them possess considerable claims to good looks, especially those descended from European and Goanese parentage. In others the Negro type more or less predominates.

The male Muzungu, except when the offspring of Goanese and European blood, shows a decided tendency towards the Negro side of his parentage, and in many instances has little or nothing to distinguish him from the ordinary Negro except that, perhaps, he is better educated. The better class are employed as clerks and telegraph operators, for which they show considerable aptitude. When I was in 1889 at Conceição, a town thirteen miles from the mouth of the river, a Dutch vessel arrived, and had almost discharged her cargo when a telegram came from the entrance of the river that a vessel was sighted out to sea. Several hours after this intimation another telegram arrived that the vessel was crossing the bar, and the next morning a third message informed us that it was proceeding up the river to our settlement. As the vessel alongside the wharf had finished discharging, she went down the river, to make room for the second vessel. We afterwards found that this was unnecessary, as we were merely being informed of the sighting and arrival of the vessel that had just left the wharf, where she had been moored for several days. A message sent on one occasion from Mopea to Quilimane, a distance of eighty miles, arrived three months late at its destination. It would, however, be unfair to give these as typical instances of the manner in which these operators work, though they are by no means isolated.

I have often felt a kind of semi-commiseration for these half-castes. They hold an unfortunate position, like Muhammed's coffin, mid-way between a superior being, as they consider the white man, and their semi-compatriot the ordinary Negro. The white man looks upon them as inferior, the Negro gazes askance at them, and thus they belong neither to the one nor the other. Their position is indeed so dubious that they have to go to extraordinary lengths to uphold it—a state of things that is not unknown even in European civilisation, where people on the boundary line fashion all their actions to imitate those whom they consider their betters. A half-caste Muzungu imagines that a white man never works, and that idleness is the stamp of nobility and civilisation. It has often caused me mixed amusement and pity to come accidentally across one of these would-be representatives of our own civilisation, seated on a bottomless chair, with five brawny valets around him no blacker than himself, one brushing his teeth, another washing his face, another endeavouring vainly to get out the spirals from his woolly hair, another cleaning his nails, and the fifth holding a cracked mirror, in which his Negro features were reflected and distorted.

Some of these Muzungus, especially in the upper waters of the Zambesi, have proved a source of considerable trouble and danger to the Government. They have in many instances collected hordes of malcontents around them, terrorised large tracts of country into submission to their rule, entrenched themselves in commanding strongholds, and defied

the Government itself. One of them, called Bonga, held the Zambesi river below Tete for many years, and effectually cut off that town from communication with the coast; and even up to the present day other bandits, or Zambesi princes, as they have been termed, levy black-mail on the local authorities, who, from want of adequate force, are wholly powerless in their hands. The last expedition sent against these rebels last year suffered a most signal defeat, the Gatling guns and a large quantity of ammunition falling into the hands of the enemy.

Above the confluence of the Shiré and the Zambesi the Portuguese have certainly no real jurisdiction away from the river. The semblance of power which they hold is entirely dependent upon the goodwill of these half-caste princelets, whose friendship is only ensured by repeated subsidies of arms and ammunition, which materially strengthen their power and influence should they think it worth while, as they periodically do, to resist the colonial authorities. Such a state of things would, in spite of an insufficiency of troops, be wholly impossible were the colonial Government to have its interests represented by officers worthy of the responsible duties incumbent on them.

The poorly paid, ignorant class of officials they send out to represent them over these vast areas, from a false idea of economy, are practically the sole cause of this disgraceful condition of affairs. To represent Portuguese interests in this region is almost a disgrace to the official. His pay scarcely exceeds that of an office-boy in a commercial establishment, and even that is often many months in arrear. He receives little or no sympathy from his superiors, and looks upon his life as an exile and imprisonment, so that, humanly speaking, it would be folly to expect him to take the slightest interest in his responsible duties.

The commercial element in the colony, if it were given more voice in the administration, would rapidly change the present disgraceful condition in which the country is now plunged; and in place of the ever-recurring futile quarrels and bloodshed, the chronic state of poverty and supineness, the colony would become a seat of industry and wealth; and it behoves the Portuguese Government, if they look at their best interests and their honour as a nation, to make a systematic inquiry, and institute a civilised and beneficent policy in the vast and wealthy regions they possess in this country.

Life in Quilimane is, on the whole, a monotonous one, and is only relieved by the hospitality and conviviality of the people. Rising at five or six in the morning, one takes a slight repast, *en déshabillé*, of coffee or green tea and biscuits. At ten is the *almoço* or breakfast, generally consisting of fowls, rice, curry, pork, sometimes beef, mutton, goat's-flesh, or other viands, the lower class having only curry and rice. At three o'clock there is tea, bread and butter, and other light refreshments. At seven is the *jantar* or dinner, similar to the breakfast. After dinner the evening is passed in social visits and at the club.

At Tete and Sena Sunday is spent in recreation by the majority of the Europeans, who betake themselves to the adjacent estates, where they pass the day in convivialities, amidst the delicious perfume of orange

and mango plantations, or make up small parties to traverse the neighbouring jungle in search of game.

The Portuguese on this river evince a politeness and hospitality that put to shame the more brusque manners of our own countrymen; and were it not for the conduct of many of the ignorant and petty officials, on whom isolation from headquarters has conferred considerable power in their districts, which they have often too little *savoir faire* to exert in an accommodating spirit towards Europeans, there would be few places in wild Africa more enjoyable from a social point of view.

The indigenous native population on the delta and in the vicinity of Quilimane is made up for the most part of Manganja and Makua, the former from Nyassa and the latter from the country between Nyassa and the coast. The language spoken is a crude patois of Manganja, Makua, Portuguese, and the old Mahindo dialect, a remnant of the ancient language of the delta, now confined to a very small area south of Quilimane.

Nearly the whole of the population were originally slaves, brought down by Arab and Portuguese traders to work on the various *prazos*, or estates; and even at the present day the traffic continues unchecked in the outlying districts. Under the superintendence of skilled artisans from Madagascar and India, boat and lighter building is carried on, though the craft are for the most part clumsy and ungainly.

The trades of carpenter, blacksmith, and builder are followed by many of the natives, though the work produced is, as a rule, primitive and inferior. A large class follow the business of canoe and boat men on the rivers, the canoes being mostly owned by Portuguese or half-castes, from whom they are hired by the boatmen. The wage of a boatman from Mopea to Tete, a journey of a month's duration, is about four shillings, including food.

Above the confluence of the Shiré the people on the Zambesi are termed Achigunda. Their language is practically a dialect of Manganja, which stretches away north till it reaches the western shore of Nyassa. On the immediate river banks the Portuguese hold effectual authority over the people, except in the vicinity of the Luapata and other districts owned by the ruling half-castes. A few miles away from the river all the tribes are independent, and in many cases openly hostile to the Portuguese Government. On the upper waters near Zumbo the whole country for many hundreds of square miles has been repeatedly devastated and terrorised by Matakenya and other half-castes, the Government being wholly unable to place the slightest check upon the inhumanities and cruelties perpetrated by this princelet, who has been installed as lieutenant-colonel in the colonial army: most of the outrages perpetrated by him are done openly under the Portuguese flag, and in the presence of an official ablaze in a Portuguese uniform—a state of things which cannot but cast a most serious stigma on the Portuguese good name in the inland countries.

The inhabitants of Tete are mostly dependants or slaves of the various residents and merchants, a few being employed in agriculture, and the vast majority as hunters. They are supplied with guns and

ammunition, and sent over the vast ivory districts to the north, returning often after one or two years with the ivory they have obtained, when they are rewarded according to their success with calico, beads, and alcohol.

The people of the Makanga and Undi countries are quite independent, the former not permitting any Portuguese subject to enter their country under penalty of death. The reason of the hatred these people bear to the Portuguese is not far to seek. It is, indeed, entirely owing to the unscrupulousness, dishonesty, and brutality of the petty half-caste traders, Muzungus, who, unfortunately supported in their nefarious actions by the authorities, have destroyed commercial confidence and ruined trade and agriculture on the waterways; and it is to be sincerely hoped that the Portuguese Government will wake up to the necessity of putting down with a strong hand the ruinous and dishonest practices of these bastard Negroes.

On the Shiré river and the Nyassa highlands we have three races of people—the Yao from the east of Nyassa, the Manganja and Angoni from the west. Of these the Angoni are the most warlike; the Yao are traders, and the Manganja pure agriculturists. In the early days of our settlement the Shiré was governed by a chief called Chibisa, whose kindness and assistance did very much to facilitate the operations of the pioneer missions. A few years later Dr. Livingstone left five of his servants, who had followed him from the Upper Zambesi, on the Shiré. These men, Ramakukan, Chipitula, Katunga, Masea, and Mlauri, collected around them a horde of malcontents, and spent their time in slave-raiding and pillaging the unfortunate inhabitants. This system of terrorising they carried out on both banks, so that even Kapeni and other powerful Yao chiefs on the Shiré highlands were forced to pay a kind of tribute to these newly installed bandits, to gain some immunity from their raiding parties. Chibisa on the west bank retired to Mikolongo. As soon, however, as the mission was well established on the highlands, the people ceased to pay this enforced tribute to the Makololo raiders on the river, trusting in the protection of the British.

The west bank, however, had never been visited by the British, and the raiding parties on that side were unchecked until my own arrival in 1891, when Chibisa's successor followed the example of the Yao chiefs on the opposite bank, and ceased to meet the demands of the pillaging parties from the river.

The Makololo have never occupied any of this country, but have kept strictly to their strongholds on the immediate bank of the river, sending out parties in every direction. During the time when the Portuguese were threatening the Colony, treaties were made with these Makololo bandits, conferring the country they had pillaged on the Government; and even their verbal claims to Chibisa's territory were accepted by Her Majesty's Commissioner—claims which are based entirely on the fact that the country has been the scene of their slave-raiding parties. To recognise such illegal claims must surely be against all equity and justice. If they are valid, the fact that the Yao chiefs and others on the east bank paid the same tribute before the advent of the British renders

them likewise subjects of the Makololo—a claim which, if conceded, would annul all the land purchases made by Europeans on the Shiré highlands. It is, indeed, contrary to all ideas of British justice to support the claims of the Makololo to country beyond their own villages, on the ground that every district to which they sent slaving and raiding parties was acquired by them. Her Majesty's Commissioner appears to be ignorant of the true history of the country he administers; and by last mail I was astonished to find that a large force had been despatched by him to the west bank to take prisoner old Chibisa's successor, and substantiate the marauding claims of the Makololo. Actions like these against an offenceless and friendly people will do irretrievable injury to the good name of the British amongst the native population.

Of the attitude of the indigenous peoples towards the advancement of progress and civilisation I shall treat in the latter part of my paper.

The agricultural development of the country will necessitate the employment of native labour. There is, however, little doubt that the mining industry will very seriously affect the agricultural interests—at least during the next few years. It will also have the tendency of educating the mass of the native population to contract for their labour on a more civilised and effectual basis than seems possible at present. Apart from the cultivation of coffee and similar products of high commercial value, the development of this country can scarcely depend on its purely agricultural resources.

There have been many changes on the Shiré and Nyassa highlands since the advent of our Commissioner. Taxes have been levied indiscriminately on white and black. The struggling industries of the few colonists have been subject to many imposts and taxes, some of them almost prohibitive. The natives have not been exempt, even during a time of exceptional famine and distress mainly due to the requirements of the new-comers forming the Administration, whose arrival caused serious inroads on the deficient supply of food in the country.

Quarrels have been picked with numerous hitherto friendly tribes, the results being in many instances little in our favour, if not altogether adverse. The colonists are looking forward to the time when the result of this heavy taxation will be used for the benefit of the colony in opening up roads, telegraphs, and otherwise facilitating the badly wanted means of communication. Up to the present, however, they have looked in vain; and in roads, telegraphs, and other improvements the Nyassa highlands enjoy none of the advantages found in the impoverished Portuguese colony on the river.

The Commercial Prospects.

In treating of new countries, especially of those in the far interior, such as that under discussion, with regard to their suitability for European residents, and hence their commercial value, one must first consider the facilities they possess of communication with the coast and home civilisation.

Without cheap and rapid means of reaching the seaboard, the resident

cannot hope to obtain any of the common luxuries that have become necessities under his new conditions of life. Commerce and trade experience obstacles too serious to admit of their effective development. The country remains in its primitive state, and the European who has the temerity to cast his lot there suffers by sickness and death from the hardships enforced by his isolated existence. Many regions possessing abundant resources have been necessarily branded as death-spots for this cause alone, and must ever continue so under such conditions.

Since, then, facility of communication is of primary importance to the development of these inland districts, in the interests both of commerce and civilisation, it is not difficult to understand how nothing has in the past tended so seriously and effectively to close the vast Zambesi regions to European enterprise as the primitive and inadequate means of reaching the coast previously existing there.

With the discovery of the Chinde entrance, enabling river craft to tranship goods immediately from ocean-going vessels, a new and brighter era has dawned on this vast region. The impulse and possibilities it has given to commerce have been almost phenomenal. In the Chinde port, where I camped four years ago amid a sandy waste covered with jungle grass, there are now sometimes to be seen four or five sea-going steamers, with a fleet of steam river-craft, and bustle and energy in the crowded streets of new buildings.

The old port of Quilimane, with its paralysing physical and political difficulties of communication, is doomed, and in a short time must return again to its old condition of stagnation and poverty to make way for its more fortunate rival.

One of the newest and most potent factors in the opening up of these regions is certainly the International Flotilla Company, which has steamers and other craft already plying along the inland waters.

Of the agricultural prospects of the region of the Zambesi basin included in Nyassaland, my friend Mr. Buchanan, who is the highest and most reliable authority, has only lately spoken most favourably and comprehensively, so that I need but slightly touch upon his remarks. He speaks in the most favourable and serious manner of the advantages this part of the country offers for successful agriculture, and the bare enumeration of the valuable commercial products the land is suited to produce shows clearly the abundant possibilities of the wealth now in course of development. He rightly lays great stress upon the deterrent influence of the high freightage from the highlands to the coast. This grave disadvantage, however, I have little hesitation in saying will this year be removed, and every encouragement will be given to local industries by the superior means of transit at the disposal of the new International Flotilla Company.

The highlands of Nyassa have up to the present given few signs of possessing mineral wealth of any commercial value, though at the same time it must be remembered that this region has hardly yet been given a fair opportunity of proving its mineral resources, since the prospecting there has been carried on only in a most desultory and inefficient manner.

To the westward of the Lower Shiré, including the bank of the

Zambesi and stretching over the vast region between these rivers and the west shores of Tanganyika, we have a huge territory under the influence of a group of companies, comprising the Katanga, Central Africa, Companhia da Zambesia, and their offshoot, the Flotilla Company.

It is to this new region that I would direct your attention. Speaking of it first from an agricultural point of view, we must consider its adaptability to European residence and colonisation. It forms part of the great interior plateau of Central Africa, its average elevation being from two to four thousand feet. The Loangwa and Upper Zambesi enable its central point to be reached from the coast by water carriage, with only one break of thirty-five miles—an advantage of the highest importance to its development. The country is for the most part rolling and undulating, thickly wooded and well watered, and in the vicinity of the many perennial rivers and streams the soil is eminently suited for successful agriculture.

The climate has been proved by myself and my assistants to be salubrious. On the banks of the Zambesi and Loangwa there exist innumerable plantations of *Coffea Mozambiquensis* and *Coffea Liberica*; although these have been neglected for several years owing to the emigration of the former planters, they will without doubt soon furnish a large export under the more energetic superintendence of the group of companies mentioned, who have taken over these territories.

In many places are to be seen miles of orange and mango forests, tracts of pine-apples, lemons, and other fruits, furnishing abundant evidence of the productiveness of the soil. In the Makanga country the natives make wheaten bread from corn grown on the spot. This is perhaps unique in Central Africa, as well as the fact of the manufacture of native-grown sugar, and gives a good idea of the advance the natives have made towards civilisation compared to their neighbours in the Nyassa highlands.

The possible output of oil seed and orchilla weed from the lowlands is practically illimitable, and will without doubt increase by gigantic bounds in the next two years, owing to the changed conditions of water-carriage and new facilities for cheap and rapid export of these valuable products.

Another feature which will do much to alter the aspect of the commerce of these regions is the fact of their being placed under the auspices of, and worked by, companies, in place of the old and inadequate method employed of dividing the country into separate estates, let out to individuals with insufficient capital and, ofttimes, energy, who were forced to recuperate themselves solely by the farming of taxes, to the almost total neglect of agriculture and commerce.

Labour in these countries is cheap and plentiful, for the people are industrious, and willing to work for a small wage.

Along the waterways there are large tracts of land awaiting the agriculturist, in a healthy climate, within easy and rapid communication with the sea, and capable of producing products of very high commercial value. The settlement of these sites by men of energy and perseverance can scarcely fail to be successful and lucrative, and there is

little doubt that, just as fortunes are being made in the neighbouring Nyassa highlands, so there will, in the near future, be as many, or even more, acquired on this plateau.

The possession of mineral resources will, as in all other new countries of this nature, have a very important bearing on the future prospects of trade and commerce, and the success of mining enterprises will do more to open up Africa, in a few years, than agriculture alone can possibly do in several generations. Its natural consequence, apart from the wealth obtained from under the soil, is, as is well known, the influx of a large number of Europeans, creating new and large demands, pouring capital into the country, and stimulating every possible industry, both agricultural and commercial, through the surplus energy of the new-comers. I have little hesitation in saying that the mineral resources will be the cause in the next two or three years of transforming the whole of this region, and placing its commercial and financial future on a totally different and higher standpoint than at present.

The whole of the plateau to the west as far as the Katanga country has been well known for years for its mineral wealth. Gold is found in all its streams, and auriferous reefs, dotted with old workings, stretch from the Zambesi to the Upper Loangwa and Bangweolo, joining there the famous copper-mines of the Katanga country. On the Zambesi river, below the Acababassa falls, is an extensive region of coal formation, immediately on the waterway and in the vicinity of the auriferous district. It is needless to comment on the possibilities the existence of this deposit opens up for the future development of the country. Nowhere else in Africa do we find a similarly advantageous state of affairs, seeing that the coal-fields and auriferous districts are in immediate communication by a navigable waterway with ocean-going steamers.

No satisfactory estimate can be obtained from the official returns of the exports and imports of the country. Ivory, for instance, finds its way to the coast and home markets by several routes—much of it, indeed, leaving the coast through German ports, and the rest being distributed between Ibo, Mozambique, Angoche, and Quilimane, the returns of which are often very inaccurate. Thirty thousand pounds' weight passed through the Chinde in 1891, and eleven and a half tons through Quilimane ; but I should estimate that only a small percentage of the total extracted from the Zambesi basin passes through the Portuguese customs. This trade is at present a very lucrative one, and gives abundant evidence of continuing for several years to come, as vast herds of elephants are still left in the interior to the north of the Makanga and Undi territories.

Of ground-nuts and sesame-seed over 5000 and 200 tons respectively were exported in 1891, the greater quantity going to Marseilles and Rotterdam. These products are, however, so bulky and unfitted for the primitive condition of communication, that the amount exported is infinitesimal compared to the output possible under improved conditions of freight and carriage, and the next two years will certainly see an enormous augmentation in their cultivation and export.

India-rubber is another valuable product, nearly 50,000 pounds having been exported in that year. Virgin forests of india-rubber exist

in the Zambesi basin, and are capable, under efficient superintendence, of furnishing an enormous output. The natives have done much, owing to their ignorance, to diminish the supply near the coast-line, their mode of collection entailing the destruction of vast numbers of trees. This, however, will be remedied in the future.

Copra is found along the coast, and some thousand tons are exported annually. Sugar is being produced on a large scale by the Companhia do Assucar de Mozambique on the Quaqua River, 60 miles from Quilimane, as well as cotton, pepper, vanilla, and coffee.

The exports consist of oil-seeds, ground-nuts, sesame-seed, copra, beeswax, india-rubber, ivory, gold dust, hides, orchilla weed, rice, and a few grains. Transport has hitherto been fatal also to the export of timber, of which there are many valuable kinds on the Zambesi, mostly hard woods, such as ebony, African teak, iron-wood, a kind of mahogany, and other species of a like nature.

The extraordinary facilities existing in this region for water carriage and communication are deserving of most serious consideration in studying the commercial future of Central Africa. The broad waters of the Zambesi furnish a navigable and practicable highway for many thousands of miles into the interior. In the vicinity of the Luena river, south of Tete, will most probably be situated the port of disembarkation for Mashonaland and the territories of the South Africa Company; and it is deeply to be regretted that, instead of attempting to construct a railway over the swamps between Beira and the highlands of Mashonaland, the energy and capital thus employed were not more profitably used in joining the Zambesi with northern Mashonaland—a route which must certainly eventually take the place of that from Beira.

The country between the Zambesi and Mashonaland is high and healthy, free from the malarial morasses and swamps on the coast-line, and from its physical conditions would entail far less expenditure in the construction of a railway. By the Loangwa and Zambesi we reach the outskirts of the Katanga country in the vicinity of Lake Bangweolo, a high and healthy country giving every promise of mineral and agricultural wealth in the immediate future.

On the Shiré river, an affluent of the Zambesi, we pass through our new British Central African Protectorate, reaching to the north end of Lake Nyassa, with only one break of seventy miles. This is now traversed by a good road, and we trust before long will be crossed by a small steam tramway.

Between this and the Chinde are already plying five cargo steamers, three belonging to the Flotilla Company and two to the African Lakes Company, besides two British gunboats, four Portuguese boats, and two other steamers—not an insignificant fleet when we consider that the Protectorate is scarcely four years old.

On Lake Nyassa there will during this year be two British gunboats besides two steamers plying, and fresh steamers put on by the Flotilla Company. This company will work in unison with the Katanga Company in the same group, who intend putting two steamers more on Lake Tanganyika. A short distance from the north end of this lake

and we are in Uganda, and within practicable water communication with the Nile and Mediterranean.

The magnitude and the possibilities afforded by this great central waterway are simply astounding. We have only to consider that it pierces the heart, and the healthiest and richest countries, of the whole African continent, and that in the near future the traveller will be able to re-embark at the Chinde, and traverse the centre of the continent by steamers with few breaks of land transport, until he emerges on the blue waters of the Mediterranean. Thus a new world will be opened to civilisation and commerce, and the darkest parts of darkest Africa will be brought under the immediate influence of nineteenth-century Christendom—a result that cannot but tend to radically transform the whole of this huge continent, and will be a more effective and rapid means of destroying the slave trade, and other abuses so long prevalent there, than any other at our disposal.

This route to Uganda must, owing simply to the superior facilities it gives, be the cheapest, most rapid, and practicable means of reaching it—advantages with which a railroad over a desert country from the coast could never compete.

As a market for European manufactures this region is already an important one; and from what I have just mentioned with regard to the prospects of the immediate development of the Zambesi basin under the improved facilities of transport, it will be readily recognised that in the near future it will become a market of very high importance to the manufacturing world.

There is at present a very fair amount of imports. In 1890 they reached £116,763 in value, besides £15,000 worth sent *viâ* the Chinde. Since then there has been a large yearly increase, owing almost exclusively to the advantages offered by the Chinde entrance. The growing community of British Central Africa offers a rapidly increasing market, mostly for dry goods, white cottons, coloured piece-goods, hardware, beads, brass wire, petroleum, cement, and corrugated iron.

The import of cotton and piece-goods is perhaps the largest, these wares being used as currency in the interior. Those of Indian manufacture from Bombay have by far the largest hold on the local market. This is mainly owing to the article being cheaper and containing less dressing than that from home manufacturers. It is of a much inferior quality, but is readily accepted by the natives, who, although they prefer British-made cloth, have little idea of their different local values, and, being long accustomed to the inferior article, are practically indifferent to their relative qualities.

The natives will, however, soon gain more discriminating knowledge and will prefer superior manufactured articles, by reason of the influx that is now going on of emigrants and capital.

From Lisbon are mostly imported wines. Rotterdam, Hamburg, and Marseilles are the great importers of cheap alcohol, of which it is estimated that 25,000 gallons were imported in 1891. Little or nothing is practically done by the Government on the coast to prevent the wholesale import of this deleterious article. In our new administration, however,

of British Central Africa, the importation of raw spirits for native consumption has been effectually suppressed; and, if this policy is strenuously carried out in the future, it will do very much to save the native population from sinking into the depths of misery and degradation they have fallen into along the coast.

Of all the circumstances which enter into an African's life, including slavery, famine, and other misfortunes incidental to his existence, there is no fatal influence to which he so quickly and disastrously succumbs as that of the poisonous liquors obtained from European markets. The depths to which the native descends under their maddening and painful effects are no less terrible than they are dishonourable to the civilisation which is responsible for such degradation.

On the Zambesi at the present day money and its equivalents are only valued in relation to their purchasing power of the worst form of alcohol, and there is no currency so sure of being accepted for labour or barter as alcohol. The natives themselves distil several ardent spirits, which are perhaps equal in strength of pure alcohol to the liquor imported for their consumption, but which do not contain flavouring ingredients to excite their palate and thirst, like those so cunningly manufactured in Rotterdam, Hamburg, and Marseilles.

The question of labour will naturally affect in a very high degree the future development of this country.

Situated as it is within the Tropics, the climatic conditions necessarily forbid any hope that it will ever be suited for European agricultural labour except in its lighter forms. There is, however, not the slightest obstacle to the successful pursuit of handicrafts by Europeans; and artisans, mechanics, and others will be able to carry on their work as effectually with regard to climatic conditions as they do in the South African and North Australian colonies.

In the Shiré highlands we have an instance of the local difficulties arising from a constantly increasing demand for labour. In the early days of this settlement no such difficulties were experienced; indeed, the supply of labour was greatly in excess of the demand. At the present time this is one of the most serious and vital problems facing the planter and agriculturist, and it is to be regretted that Her Majesty's Commissioner does not appear to have yet thoroughly grasped the momentous bearing this question has on the future welfare of the country.

I am of opinion that the mode of payment of labour, which still retains its old characteristic of barter, has much to do with the present state of affairs. Before coming in contact with Europeans, the natives have not been used to giving up their time wholly and solely to an employer. The remuneration they receive merely supplies them with the luxuries of life, such as clothing and ornaments, not with the necessities of life, as is the case in more civilised communities.

When the demand for labour is small in comparison to the supply, as is naturally the case on the advent of a few planters and agriculturists in a thickly populated district, the labourers experience no inconvenience in giving up a small portion of their time for the acquisition of these luxuries, the far greater part of their labour being expended indi-

vidually in providing themselves with the necessities of life, namely, food; when, however, there is a large influx of planters and agriculturists into a district, the natives are unable to encroach on their private labour in their gardens and farms in return for the remuneration given them by the new employers, or they would have a large stock of calicoes, handkerchiefs, beads, and similar articles, and no food to sustain life.

This is practically the root and cause of the labour difficulty. Its solution appears to me an easy and effectual one. In planting on the Shiré highlands, the time at which labour is most required is always the period in which the natives are obliged to attend to their own agriculture, which they cannot give up in the interest of the European planters without bringing famine on themselves next season.

I venture to offer as a remedy for this serious labour difficulty, one which is of such vital importaance to the well-being of this part of Africa, the following suggestions:—

Knowing that the radical cause is the want of attention to the production of native foods, I would recommend as essential that very serious attention should be given by Europeans to the wholesale cultivation of native grains and cereals. Under European supervision, and with the introduction of labour-saving implements and more prolific kinds of grain, I feel confident food could be obtained on as cheap a scale and with far less expenditure of labour than is possible among the natives themselves. Their mode of agriculture is most primitive and wasteful, necessarily entailing a vast and useless expenditure of their labour, which could, under Europeans, become a source of gain not only to themselves but to the white colonists and planters.

Small stores should be opened for retailing food to the natives. The payment of labour should be in coin, and not in kind; and the natives would soon find that their labour for Europeans was much more advantageous to themselves, as with the remuneration they received they could obtain, not only the luxuries which are at present their only reward, but also food and sustenance. This, of course, is one of the primary axioms of social economy, but it has been strangely neglected in our dealing with the people in the Shiré highlands, with the result that a most serious and wasteful expenditure of labour and wealth has been entailed.

While the native has to rely on his individual labour for food, it is impossible to hope that there will be any amelioration in the difficulties attending the labour question.

Should planters still continue to pay their labourers in calicoes and dry goods merely for the sake of the small extra profit they may make on these articles, they will in the immediate future discover that the want of labour supply will handicap them so effectually as to make planting and European agriculture in these districts a financial impossibility.

I should like in this place to make a protest against the introduction into this Protectorate of the rupee. It is so close to our possessions in the south, where British money only is used, that it can serve no good purpose to encourage our Indian silver currency. Rupees are generally

used on the river, but the experience we have in Delagoa Bay and Portuguese ports to the south shows the remarkable manner in which our home coinage is swamping every other.

The Portuguese coinage in the Province is quite inadequate. It is made up of Maria Theresa dollars, Portuguese coppers—the calculation of whose respective values requires an education, since many that are worn and defaced have a currency of half their stamped value, and there are many other anomalies—oblong pieces of gold and silver coined in the beginning of the century in the Province, and the rupee, which fluctuates from day to day, seemingly always for the worse.

The exclusive use of British currency in the new Protectorate will very soon swamp that previously used on the river; and if this policy is strictly carried out, the day will not be far distant when the sole currency in British and Portuguese East Africa will be our own, greatly to the benefit of trade and commerce.

In summing up the future prospects of this vast region, if we only consider the suitability of the greater part of its area to European enterprise, its valuable mineral wealth, its possibilities of agricultural development, and the enormous advantages and facilities that exist there for inland carriage by the network of navigable waterways that intersect it in every direction, we shall not exaggerate when we assert that the Zambesi basin has a commercial future before it second to none in Africa.

REPORT OF MR. F. C. SELOUS' LECTURE.

(*Delivered at a Meeting of the Society in Edinburgh, March* 1893.)

The Lecturer commenced by stating that he made no claim to be considered a scientific explorer when he first went out to Africa; he made no observations at all. However, he very soon entered a country where no European had been before him, and he then commenced to draw small sketch-maps, which had from time to time been published in the *Proceedings* of the Royal Geographical Society. Later on he began to use the compass. He thought he could say that his sketch-maps gradually became more accurate, and during the last three years he had been able to make a compass survey of almost the whole of Mashonaland. It was about twenty-two years since he first commenced his wanderings in the interior of South Africa. At that time the facilities which existed for communication between the Cape and the interior were very different from what they were now. In the whole of South Africa there was then only one short line of railway, that between the coast and Wellington.

In 1871, when only nineteen years of age, he landed in South Africa, and proceeded up the country to the newly discovered diamond fields—a journey then made in a bullock-waggon in two months, but which could now be accomplished in thirty hours by railway. He was not interested,

however, in either diamonds or gold: his desire was to get away into the interior for sport. In April 1872 he started on a journey to Matabeleland, and the same year reached Lobengula's head kraal. At that time Lobengula was not at Bulawayo, but had trekked away to a small village, six miles to the west, in order to get better pasturage for his cattle. The chief came to see him, accompanied by an Englishman, Mr. George Phillips, who had already spent eight years hunting in the country, and who was kind enough to act as interpreter for him. Lobengula was then a man of forty-five years of age, standing about 5 feet 10 or 11 inches high, strongly and stoutly built. He had already become very corpulent. When enjoying the dinners of civilised society, Mr. Selous often thought of the repasts he had partaken of in company with Lobengula. An immense wooden trough used to be brought in, piled up with pieces of boiled beef. On these was laid a great carving knife which Lobengula had got from some trader. The king helped himself to a large piece of meat, stuck his teeth into it, and then cut off the rest close to his mouth with the carving knife. The guests were not provided with knives, and had to look after themselves. After the meat a calabash of beer was passed round, like the "loving cup" at home. Lobengula told Mr. Selous at first that he was too young to hunt elephants, but finally gave him permission, and said the whole country was open to him. Mr. Selous spent three years elephant-hunting in Lobengula's country, and so much enjoyed the free life he led that he never once regretted having left the haunts of civilisation. During that time he travelled over a large extent of country, but, he was sorry to say, he never at that period made any sketch-maps. In 1873 and 1874 he travelled through the whole of the beautiful and well-watered plateau of the Lunde river: and it was through this very same country that he led Sir Henry Loch in 1890—so well had its features been fixed in his memory. In his wanderings in Matabeleland he went as far west as the Victoria falls on the Zambesi, and along the southern bank to the Chobe. It was in 1874 that he noticed for the first time the curious phenomenon of a rise of the waters of the Chobe during the dry season, and he observed the same again in 1877 and 1879. This curious occurrence of a river rising at the time of the year when other rivers were steadily decreasing in volume suggested that its springs must be fed from snow melting on high mountains. However, he believed it was well ascertained that no such mountains existed near the source of the Chobe, and the reason of this phenomenon had still to be discovered.

In 1879 Mr. Selous crossed the Chobe, and hunted between that river and the Zambesi: and in the same year he visited the old town of Linyanti, which was mentioned in Dr. Livingstone's first book of missionary travels. At that time the country was in a rich and prosperous condition, and densely peopled. In 1879 he found nothing but the remains of the old town. The cattle had gone, and had been replaced by the buffalo, and with the buffalo had come again the tsetse fly in large numbers. This desolation, Mr. Selous explained, was caused by the civil war which occurred in connection with rival claims to the chieftainship of the country. Between 1878 and 1882 he lived in Mashonaland, and

visited nearly every acre of it. He traversed the Umfuli river to its mouth, thereby proving that it did not run directly into the Zambesi, but was a tributary of the Sanyati. In another journey, in 1889, he traced the Mazoe river to its junction with the Ruenya.

On the 11th September 1890 the British flag was hoisted on Fort Salisbury by the pioneer force of the British South Africa Company. Previously to that, Mashonaland had been little known, even by name, to the great majority of people at home. But within the last few years a great and wonderful change had taken place. Townships had sprung up, not only in name, as many people would like to make us believe, but in reality. Substantial brick houses had been built in Fort Salisbury, belonging not only to the Company but to private individuals also. A weekly newspaper, nicely printed, was published in Fort Salisbury, and the place was now in telegraphic communication with England. In fact, there was every sign of substantial progress in the country since the British flag had been planted in it, and the foundations had been laid of a prosperous British colony. Of course the development of the country depended to a great extent on the richness of the goldfields; but he thought he could say that their richness was now a proved fact. It was impossible to say that the numerous reports which had been sent home by the representatives of the different syndicates were false. He had seen the mines himself, and he knew many people interested in the gold industry, whose statements could be relied on. He was convinced that there was a great future in store for Mashonaland, and that gold was there. It only needed development; and when the railway was made, the facilities for the development of the country would be greatly increased. Of course the future success of the country, as of all British colonies, depended very much upon the climatic conditions—upon whether Europeans could live there, and rear strong and healthy children. Well, he was quite convinced that the climate was suitable for Europeans. There was no such thing as intense heat, even in the hot season. The bricklayers at Fort Salisbury were able to work all day right through the hot season. The nights were always cool. There was no such thing as a hot night on the plateau, and in winter the nights were very cold indeed. Of course the climate depended to a great extent on the altitude of the country, the greater part of which was 3000 feet above sea-level, while much of it rose to a height of 5000 and 6000 feet. The coolness of Mashonaland arose principally from the fact that it was the highest land in South-East Africa, and that it caught the cool winds from the Indian Ocean. At Christmas 1889 Mr. Selous was in Cape Town, and it was an uncomfortably hot day. Next year he spent Christmas in Mashonaland, on a plateau about 50 miles east of Fort Salisbury. It was a pleasant, cool morning until after eleven o'clock, when the sun became hot, though not excessively so; at about four o'clock the air was nice and cool, and the evening was quite cold. The same weather prevailed all through the "hot" season. The country was undoubtedly a healthy place for Europeans. Of course there was fever, but he believed a good deal of it was the result of exposure in the rainy season. The first year the settlers passed in the country they

were badly off for food and shelter of every kind, and in the rainy season almost every one suffered more or less from fever of a mild type. But when the people were more comfortably housed, and had a supply of good food, the fever almost entirely disappeared. There was scarcely any fever at Salisbury during the second rainy season, and he thought it would disappear as the conditions of life improved. Many men had blamed the country for fever which was brought on solely by intemperance and exposure during the rainy season.

Before the European occupation Mr. Selous travelled amongst many tribes in Mashonaland who had never seen a white man. He never had any strong force under him—usually only from five to ten unarmed personal attendants. He was always, therefore, at the mercy of the natives; but he had nothing to complain of except the usual extortion, and never, except on one occasion, suffered from any hostile action.

The concluding portion of Mr. Selous' lecture was taken up with the narrative of a stirring adventure which he experienced in 1888 in the Barotse country, on the north side of the Zambesi, from which he just escaped with his life. He had no white men with him, his chief assistants and interpreters being a Zulu boy named Paul, who had married a Batonga woman, and could speak the language of the country very well, and a boy called Charlie. He had about 15 other boys, hired on the banks of the Zambesi, mostly Batongas, and 16 donkeys. On crossing the Zambesi below the Victoria falls, he found the country in a very disturbed state, Sikabenga, the young brother of the ruling chief Lewanika, having fled away with a portion of the tribe, and established himself on the plateau between the Kafukwe and the Zambesi. When he travelled among the same people in 1877 he found that no white man had visited them since Dr. Livingstone was there in 1861. He (Mr. Selous) was then strange to them, and they were more or less afraid of him; but in 1888 a white man was no longer a novelty, many of the people having been to work at the diamond fields. All the old superstitious fear of the white man had gone; now the natives only looked upon him as a sort of milch cow—a person to take as much from as possible. After a good deal of bother, he got as far as Monze's village, which Dr. Livingstone had passed on his first journey from east to west. Monze remembered Dr. Livingstone perfectly well, and spoke of the Doctor having made an observation on one of the neighbouring hills, which he climbed for the purpose. Although this visit happened thirty-five years before, Monze had never seen another white man in the interval, and he spoke of the event as if it had occurred only a few months ago. Mr. Selous found it very difficult to obtain from Monze any information regarding the country to the north; but at last he met with two men who said they could take him to the Kafukwe. He was warned against the Mashukulumbwe, whose country lay to the north of Monze's, and who were reported to be the most savage people in that part of Africa. About two hours' walk from Monze's the party came to a small town which was governed by a sister of that chief. Parting with her on very friendly terms, they reached the same evening the first Mashukulumbwe village, and certainly the people were very savage-looking. The men were absolutely

naked. They shaved their heads except a portion on the back, where they formed the hair into a cone, plastered with resinous gum and beeswax, which rose above the head, in some cases as high as two feet. In the apex they stuck a splinter of antelope horn, which shook like a piece of whalebone when they walked. Every man carried in his hands a bundle of barbed assegais, and presented a very formidable appearance. When the party came to this Mashukulumbwe village the natives ran away, but very soon they returned, and, gaining confidence, stood around in groups, occupied especially in examining the donkeys, for they had never before seen any animal used as a beast of burden. In this Mashukulumbwe village, some of Sikabenga's people, who had followed him up, came to Mr. Selous and wished to buy powder. He found out afterwards that Sikabenga had sent this party after him to get the powder from him or kill him; they were the same people who were responsible for the attack on his camp further up the country. For three days he travelled northward, and passed through several small Mashukulumbwe villages. On the third day, however, he came suddenly into a thickly peopled district; the villages could not be seen at a distance, for they were hidden by the long grass six or seven feet high. The natives, carrying their barbed javelins, were about them in a minute, examining himself and his people, the donkeys and their loads; but they were very good-natured, and at his request brought him to the head-man of the place, who was called Minenga. The head-man insisted on his pitching his camp inside the village, and, though he was not very willing to do so, he did not think it well to refuse. He, accordingly, made a camp not far from the central kraal, dug a trench round it, and fenced it in with mealy stalks. Mr. Selous wanted to push on next day, but Minenga would not hear of it. That evening the village was crowded with strangers come to see the visitors, and there was great feasting and noise. Minenga sent an invitation to drink beer; but as Mr. Selous was tired, his boy Paul went in his place. Paul was closely questioned by the chief as to the object of the expedition and the quantity of goods that the donkeys carried. Next day Mr. Selous went out at daylight with Minenga's permission, and shot a large quantity of game—elands, zebras, and various kinds of antelopes—and gave part of it to the head-man. During the whole day the people crowded round his camp, but in the evening an absolute quietness fell over the village, in marked contrast to the din of the previous night. Mr. Selous was very uneasy; he would have retreated, but he did not know how to get his donkeys out of the kraal without arousing suspicion. Men were seen whispering together at the corners of houses, and presently Paul came and said that Monze's men had informed him that the women had been sent out of the village. Mr. Selous then knew that something was wrong, and put out all the fires within his enclosure, took up his rifle, and warned his boys to be on the look-out. It was agreed that the party should endeavour to retreat into some long grass close at hand, but the deliberations were suddenly cut short by an attack of the Mashukulumbwe; javelins were thrown, guns were fired, and it is a wonder that any one escaped, so fierce and sudden was the rush. Mr. Selous made for the long grass about forty yards away, where he lay

hidden for two hours, cautiously looking out for some of his followers. He was 300 miles from his waggon with very little clothing, a rifle, and a few cartridges. Finding none of his men, he determined to travel as far as he could while it was still dark, choosing a different route from that by which he had come. The ford in the river on which the village was situated was watched, so he swam across lower down, carrying over first his gun and then his clothes. Marching by night and lying concealed by day, he reached, after great hardship, the village of Monze's sister. There one of Sikabenga's men had remained behind sick when the others followed Mr. Selous to Minenga's; and, seeing him returning in such a destitute condition, he knew that his camp had been sacked. This man lay in wait to shoot him, and nearly succeeded. Mr. Selous escaped from the village with his life, but with the loss of his rifle, which a man managed to steal while its owner was dozing by the village fire. Not knowing the part Sikabenga had taken in the plot against him, Mr. Selous now took his way to the camp of that chief, and after many hardships reached it. Sikabenga's people were not at all friendly, but the chief, who knew him by name, was very averse to killing him. He stayed with Sikabenga three days; then the chief sent an escort with him along the road to Pandamatenka, where his waggon was. After two days they came to the country of a petty chief, who, believing Mr. Selous' assurance that he would reward him from the goods he had at Pandamatenka, gave him men to conduct him thither. Fourteen days after the attack on his camp, he reached the trading station. Paul and Charlie both turned up, but twelve of the men were massacred by the Mashukulumbwe.

THE ISLAND OF TOBAGO.[1]

While Trinidad has long been recognised as connected with South America, inasmuch as its geological formation, as well as its fauna and flora, stamp it as an appendage of that continent, the geographical relations of the smaller island of Tobago, which lies rather further towards the north-east, have not been definitely settled, though, from considerations of a general nature and such explorations of the island as have been made, it is natural to class it with Trinidad. Its short distance from this island—only 18 miles—is not decisive proof of geographical union, for the Bahamas, though situated at no great distance from North America, present striking differences. Of more importance is the shallowness of the sea between Trinidad and Tobago, where the depth is only 40 to 55 fathoms, whereas the straits of Florida are about 440 fathoms deep.

During repeated visits in the years 1889 and 1891, Baron Eggers had opportunities, especially by botanical researches, of throwing some light on the question, though from want of time he was unable to collect all

[1] Abstract of an article by Baron H. Eggers in the *Geographische Blätter*, Bd. xvi., Heft 1.

the evidence necessary to establish the connection of Tobago with the South American continent.

The island lies between 11° 8′ and 11° 24′ N. lat., and between 60° 24′ and 60° 54′ W. long. Its longer axis, running from north-east to south-west, is 29 miles in length, and its breadth nowhere more than 9 miles. Its area is about 135 square miles.[1] The coast line is very irregular, for a number of small indentations, separated from one another by low mountain spurs, run into the land, besides the larger inlets of Scarborough Bay and Queen's Bay on the south and the extensive Man-of-War Bay on the north-east side. Few islets lie off the coast; the largest is Little Tobago on the north-east, rising to a height of 500 feet, and uninhabited. While the south-western portion of Tobago is on the whole low and flat, near Scarborough the land begins to rise considerably, and forms a mountainous country of no great elevation, but rugged and intersected by steep ravines, which extends up to the north-eastern extremity. The main range lies in the direction of the longer axis of the island, and culminates in Pigeon Point, 2300 feet high, near to Man-of-War Bay. Running at no great distance from the northern side, this range divides the island into two unequal longitudinal sections, the broader lying to windward—that is, towards the south-east—and the narrower on the leeward side. Consequently, the mountains on the north side fall steeply to the sea, while the southern slope sinks more gradually, and leaves room near the coast for a few small plains. On this side, therefore, the water collects into a number of streams, of which the Hope, Hillsborough, Great Dog, and Great Rivers are the most important, while the northern side is drained by short, violent torrents. The largest river of the island, however, the Courland, lies on this side; during a large part of its course it runs south-westward along a narrow ravine, and then, turning to the north-west, enters the sea near Plymouth.

Orographically, Tobago, like Trinidad, may be regarded as a prolongation of the Caribbean mountains of Venezuela; and it appears, as may be gathered from the results of such geological investigations as have been carried out, to be constructed of sedimentary rocks upheaved and broken by eruptive forces, particularly red or yellow calcareous clay slates very susceptible to the denuding action of the weather. Among eruptive rocks basalt and diabase containing large crystals of felspar are most conspicuous. Masses of dark green trap also are imbedded in the clay slates, even at great elevations. In the south-west coral limestone, rich in fossils, is the most prevalent formation, though here and there lies a thin layer of yellowish-red clay containing a large admixture of lime. On the high ridges a yellowish loam has been formed by the action of the elements; it is of no great fertility, but with sufficient moisture supports trees, and is well suited for cocoa and coffee. In the valleys and on the coast the soil, much of it exposed to floods, is deeper and richer, and is capable of yielding all kinds of tropical products. Only the flat south-western corner of the island is dry and sterile, owing chiefly to deficient rainfall. Everywhere between the rocky promontories the coast is fringed

[1] The *Statesman's Year-Book* gives 114 sq. miles.

by a belt of coral sand, continually washed up by the waves, which, mingling with decayed leaves and organic remains, constitutes an excellent soil for coco-palms.

Volcanic action does not now manifest itself in Tobago, and earthquakes, by no means uncommon in the other West Indian islands, seem to be unknown here.

An equable temperature is the natural consequence of the geographical position of the island, and here there are no great elevations, which on the continent give rise to land breezes at night, reducing the temperature considerably below that of the day. And not only is the daily range very insignificant, but the yearly variations also are of no great importance; only during the prevalence of the trade-wind, or in long-continued rains, is there some diminution of warmth. From observations made for a series of years by Mr. L. G. Hay, it appears that the yearly temperature ranges from a mean minimum of 73° F. in February to a mean maximum of 88° F. in September, while the mean for the whole year is 81° F. The lowest absolute temperature observed was 68° F., but it is very seldom that the thermometer falls below 71°. In May 1891 Baron Eggers recorded a temperature of 99°. The atmospheric pressure is also subject to small variations only.

In accordance with its latitude the island has a rainy season lasting from the end of May to the end of December. But rain falls also, in smaller quantities, in the other months, and continued drought is quite an exceptional occurrence. In these months, however, the quantities of rain are less, and are distributed over a greater number of days. Whereas, for instance, the mean fall in September is to that of February in the proportion of 5 to 1, the rainy days are in the proportion of 4 to 3. Measurements made by Mr. F. Seeley at Courland Cottage, in the middle of the island, show that the average annual rainfall during the years 1874-81 was 71·11 inches, and the average number of rainy days 146·2. Among the wooded heights of the north-east the rainfall is no doubt much heavier, while towards the south-east it gradually diminishes. At Scarborough Mr. Seeley found the average for the years 1882-89 to be only 62·35 inches. Still less is the fall on the flat south-western foreland, where it barely attains a mean of 40 inches, and where the deficiency of moisture is manifested by the dry character of the vegetation. The climate of the neighbouring island of Trinidad is very similar, the yearly mean temperature at Port of Spain being 83½° F., and the average annual rainfall 70 inches. The higher temperature is due to the position of Port of Spain, which is sheltered from the trade-wind.

The prevailing wind on Tobago is the north-east trade-wind, which, however, at this distance from the Equator, blows pretty directly from the east, and is particularly strong from November to July. During the other months feeble and changeable winds, generally from the south, are experienced. In these months also occur the fearful West Indian hurricanes, which visit Tobago much less frequently than the islands further northwards, while Trinidad appears to lie quite outside their sphere.

In general, the climate, though hot, is healthy and agreeable. Fever seldom occurs, though occasionally it presents itself in a dangerous form.

Among the Negroes, who form the larger part of the population, *yacos*, a kind of leprosy, fostered by negligence, has spread over nearly 10 per cent. of the people, and has only lately been successfully combated by the energetic efforts of Dr. Tulloch, seconded by legislative enactments.

The vegetation of the island falls naturally into three divisions—the plants of the flat south-western extremity, the crops of the cultivated central part, and the flora of the northern forest region, all which, though of the same general character, present important differences. On the coast the vegetation is similar to that of other West Indian islands, and varies with the formation of the shore—sand, rock, or swamp. Here are found, among other forms, the South American *Montrichardia aculeata* and an aroid 10 or 12 feet high with lanceolate leaves, common also to Grenada. The south-western flat land, now that the former partial attempts at the cultivation of sugar and cotton have been abandoned, is clothed with dry brushwood intermingled with a few scattered trees. Its constituent forms betray the deficiency of the rainfall in this region. The most common plants have hard, stiff, and finely divided leaves, and belong to such species as in one way or other are able to endure drought—as, for instance, acacias, Campeche wood, mimosas, cordias, *Malachra*, *Lantana*, etc. Of taller trees are seen *Spondias Lutea*, *Genipa Americana*, *Andira inermis*, and large specimens of the Indian tamarind, which generally mark the sites of former dwellings. On the other hand, plants frequently found on similar lands in the West Indies, such as croton, cactus, and *Melochia*, are absent here—a proof that the climate is not so dry, and that the soil is of a better quality, for the croton and cactus, in particular, spring up on the driest and poorest land. On some spots agaves and *Fourcroya* grow, and yield material for the fibre manufacture. Otherwise little advantage is derived from this corner of the island. On the sandy coast a few plantations of coco-palms have been laid out, and in the bush a few cattle graze on scanty pastures, consisting of a thin, stiff grass, *Sporobulus Indicus*, and the leaves of various bushes and dwarf trees. In time, no doubt, the land will be turned to account, being peculiarly adapted for the cultivation of the above-mentioned fibrous plants.

At a line running from the western side of Scarborough across the island to Plymouth, commence the first slopes of the hills; and, at the same time, the cultivated districts, which embrace the middle and eastern parts of the island, and are covered with plantations of sugar-cane, meadowland, and fields of maize, yams, and pigeon peas (*Cajanus Indicus*), as well as the usual vegetables of the Tropics. The ground is very hilly, and little of it is adapted for agriculture on a large scale, though the soil is of good quality, and, assisted by an abundant rainfall, produces large crops. The cultivation of sugar, which on most islands barely yields a profit when carried on with improved machinery, and continues to hold its ground solely owing to the difficulty of introducing new crops, is now very restricted in Tobago, the average annual production not exceeding 3000 tons, or about the yield of a single large plantation in Cuba or Demerara. The cultivation is usually carried on under the metayer system, by which the planter supplies the ground and the necessary machines, while the workmen, in lieu of wages, receive half the profits—an arrangement productive of much negligence and frequent disputes.

Sugar plantations are now confined chiefly to the small level tracts along the lower courses of the streams and in the lower parts of the valleys, while the hilly country has been allowed to transform itself into pasture ground. It is covered with various grasses of poor quality, and is overgrown with bushes, which in all damp tropical lands continually threaten destruction to the herbaceous vegetation, and have to be repeatedly cut down and burned. In this brushwood some very characteristic varieties occur, which are not found on other West Indian islands, though, on the other hand, they are denizens of Trinidad and South America. Among these are the Grigi palm (*Desmoncus major*), a prickly tree 16 to 20 feet high, having leaf-ribs furnished at the extremity with five or six pairs of recurving hooks, which serve to hold the plant erect in the woods. The fruits of this palm ripen in November, are of the size of a cherry, and, being of a bright red colour, contrast strongly with the large prickly leaves. Other forms belonging to the South American flora are *Solanum hirtum*, *Loranthus Orinocensis*, several naturalised fruit-trees, varieties of *Miconia* and *Euphorbia*, etc., and the widely distributed *Polypodium vaccinifolium*, which here takes the place of *P. pilosellioides*, so common in the other islands.

Beside these true South American plants grow a large number of varieties which spread more or less northwards, and constitute the connecting links with the West Indian flora. To these may be reckoned numerous bushes and low trees, such as *Guettarda scabra*, *Cordia cylindristachya*, *Picramnia pentandra*, *Spondias lutea*, *Andira inermis*, the last two attaining a considerable height, as well as several lianas and the guava, which has now become cosmopolitan, and here, as elsewhere, grows in large masses. On the open pastures the commonest grasses are varieties of *Sporobolus*, *Panicum*, and *Paspalum*, among which grow several kinds of *Cyperaceæ* and various herbs and small bushes. Scattered about over these lands is also seen the elegant Grougrou palm, *Acrocomia sclerocarpa*, with edible fruit and a trunk which is converted into narrow but very durable planks. The weeds that are distributed over the whole of Tropical America thrive on Tobago: whereas the genus *Eugenia*, so common on the more northern islands, being represented by no fewer than seventeen varieties in the Virgin Isles, is totally absent. Fresh-water *Algæ*, especially *Spirogyræ*, abound in the rivers, often completely filling the beds, which for the most part consist of shallow stretches interrupted by deep pools, with a dark-green slimy mass.

In the cultivated district are situated the towns of the island—Scarborough, with 1300 inhabitants, and the still smaller Plymouth on the northern side. Order and cleanliness are the rule: on all sides stand neat houses and elegant churches. The harbour of Scarborough is excellent, and once a fortnight holds communication with the outer world by means of a steamer which plies between this port and Trinidad. The trade is small, being confined to the exportation of firewood to Barbados, sugar, and a small quantity of cocoa. The imports, consisting chiefly of flour, groceries, and manufactured goods, are brought partly direct, and partly through Barbados, the emporium for the surrounding islands. An agricultural society is established in Scarborough, which

promotes in various ways the progress of the island, introducing and fostering new industries, such as fibre extraction, the cultivation of cocoa, caoutchouc, etc.

The northern part of Tobago, as already remarked, is clothed with unbroken forest, which round the large Man-of-War Bay descends to the coast. Partly owing to the elevation, which ranges on an average from 1300 to 1900 feet, and partly in consequence of the thick forest (?), the rainfall is very considerable, and favours the growth of a luxuriant vegetation, comprising many forms that require an atmosphere constantly moist. The flanks of the hills are very steep, and the valleys narrow and gloomy, often contracting into rocky gorges, in which the small streams precipitate themselves over perpendicular walls, so that the traveller has to scale the rough slopes and make a long detour. Here, as in typical tropical forests, is found a varied combination of the most diverse kinds of trees, bushes, lianas, and epiphytic plants, all mingled together instead of growing, as in colder climes, in clumps or groups of a single variety. Here are seen large and small trunks laced together by interminable tendrils of liana, small underwood, herbaceous plants and stalks, either clothing the banks of the streams or adhering, as epiphytes, to the trunks and branches of the trees, and a dense confusion of foliage of every description, from the small laurel shape to the huge feathery fronds of palms, and from the finely divided tender leaves of the *Cæsalpiniæ* to the large grey downy lobes of the *Cecropiæ*, the whole producing a gloom seldom relieved by large blossoms.

Careful observation soon ascertains that the forest of Tobago, though in general character resembling that of the more northern West Indian islands, exhibits in many respects marked differences, and affords opportunities for many interesting comparisons. For instance, ferns and orchids occur in large quantities on the Caribbean islands, where they are some of the most distinctive forms of vegetation, whereas in Tobago they are rare, both as regards the number of individual plants and in varieties. On the other hand, aroids and *Bromeliaceæ* make here, as well as in South America, a far greater show than on the former islands. Especially striking is the absence of tree-ferns, found at low altitudes throughout the West Indies, and composing a large part of the woods even in the neighbouring island of Grenada. In compensation Tobago possesses a larger number of various kinds of palm, the most common genera being *Geonoma*, *Bactris*, and *Euterpe*. Of the more conspicuous trees may be mentioned *Cedrela odorata*, *Cecropia peltata*, *Sapota sideroxylon*, *Rustica pauciflora* Solered., first discovered here by Baron Eggers, and a number of small trees and bushes, such as *Brownea rosea*, which furnishes a very tough wood used in the manufacture of small articles. Different kinds of *Sapota* and *Tecoma*, *Maclura tinctoria*, *Hymenæa*, and *Cordia* yield excellent timber or other useful products, and are to a certain extent felled for export. But as they have to be sought here and there among the woods, and transported over very difficult ground, their exploitation is not very profitable. Among the numerous epiphytic *Bromeliaceæ* are seen splendid specimens of *Æchmea* and *Tillandsia*, and trunks and large boughs are occupied by *Aroideæ*, *Peperomiæ*, *Gesneraceæ*,

and *Clusiæ*. Also in the narrow valleys many aroids grow on and between the rocks, as well as gregarious and semi-herbaceous plants which here find in the dark shade and abundant moisture the most favourable conditions of existence.

In this forest region there are many spots well adapted for the cultivation of sugar-cane, cocoa, coffee, and caoutchouc, and all these plants have already been planted in many of the valleys, with results that promise well for the future prosperity of the island.

While the fauna of Tobago, as demonstrated above, contains a large admixture of South American forms, and affords evidence of a close connection between the island and the continent, this is the case in a still more marked degree with the fauna, which exhibits a thoroughly continental character, though interesting peculiarities are not wanting. In contrast to the other West Indian islands, where animal life is scarce, Tobago, in common with Trinidad, is inhabited by a number of South American mammals and reptiles. Besides several bats are found the peccary, the manicou (*Didelphis nudicaudata*), a kind of squirrel and divers other rodents, a gopher (*Ascomys*), and a small deer, none of which exists on the more northern islands. Here lives the agouti, common to many West Indian islands, and the armadillo, found in Grenada and called there also Boy-in-Armour. On the other hand, two monkeys, the great ant-eater, and a large rodent known by the name of Lape, which inhabit Trinidad, are unknown in Tobago.

The avifauna is fairly abundant, and embraces, according to Mr. James Kirk, who has lived for forty-nine years on the island and studied its birds, 148 varieties, of which 52 are birds of passage. A large number are singing birds, and there are also pigeons, parrots, and humming-birds with splendid plumage. One of the most common is the Yellowtail, black with two long yellow feathers in the tail, which, on account of the havoc it works among the young maize, is excluded from the list of those birds for which a close time during the period from April to September is provided by statute. Certain of the pigeons, and a brown heathcock with black markings, are not found on Trinidad, and a critical comparison would doubtless bring to light other very interesting differences, though the distance between the islands is apparently too small to interpose any great obstacle to the migration of birds. It has been noticed in other parts of the world also, as well as here, that straits of no great width often limit the habitat of certain species of birds.

Turning to the reptiles, we find on Tobago an alligator, which is by no means uncommon in the rivers, and attains a length of five feet. It is not, as a rule, dangerous to man. Sometimes in the rainy season, when the Orinoco discharges large volumes of water, turning the whole sea yellow right up to the east coast of Tobago, it happens that a large specimen is carried across from the continent by the current. Only a few years ago an alligator nearly 20 feet long made the voyage on a tree trunk, and was killed on the island. To the list of lower forms must be added leguans, ants, numerous kinds of *Anolis*, and snakes of divers species. And here we meet with one of the most interesting divergencies between the faunas of Trinidad and Tobago. The latter possesses only

harmless snakes, whereas Trinidad harbours no less than four poisonous kinds, namely, two coral snakes (*Elaps corallinus* and *lemniscatus*), the much-dreaded Mapipire (*Trigonocephalus* ?) and the Cascabel (*Crotalus horridus*), which often cause the death of labourers in the fields and woods. Trinidad possesses also several non-poisonous snakes, such as varieties of *Boa* and *Epicrates*, natives of South America, which do not occur on Tobago. The distribution of poisonous snakes in the West Indies, as is well known, is very singular, for in the whole archipelago no poisonous snakes occur except in Martinique and Sta. Lucia, where the dreaded *Trigonocephalus lanceolatus* is found. The presence of this snake, which also lives in Guiana and Brazil, is very hard to account for, and one is almost inclined to credit the popular tradition that it was imported to extirpate the rats. Almost as singular is the absence of poisonous snakes in Tobago, whither, one would think, they must ere now have found their way across the narrow seas, aided by the currents.

The Doctor snake, which is not infrequently met with in Tobago, affords a curious example of "mimicry." It is about a foot long, and with its red and black rings closely resembles the coral snake, but is not poisonous and quite harmless.

From the foregoing notes on the fauna and flora of Tobago, it is evident that the island may be regarded as a connecting link between the strictly continental Trinidad and the West Indian islands, particularly the Caribbees, though it is most closely connected with Trinidad, and must be assigned with it to the South American continent.

Apart from a possible union of the two islands at some former period, the current proceeding from the Orinoco is in itself sufficient to account for the presence on Tobago of continental animals and plants. On the other hand, the existence of endemic forms, together with the absence of many plants found in Trinidad and widely distributed over the continent, particularly *Melastomaceæ*, palms and orchids, as well as of several mammals, among them the poisonous snakes, renders the question more complicated, and gives to the island, in spite of many connecting ties, a position to a certain extent independent and full of interest.

It is chiefly by the determination of the relations of individual islands to one another and to the neighbouring continents, based on thorough and conscientious investigation of the geology and the fauna and flora, that the solution of the important problems of the origin and distribution of animal and vegetable life can with the greatest certainty be approached. On continents, where the facilities of distribution are much greater, and where the traces of this distribution are easily obliterated or blurred, such questions are difficult of investigation, even if they do not completely defy solution.

Tobago was discovered by Columbus in the year 1498, but was never colonised by the Spaniards, who founded only unimportant settlements even on the far larger and richer island of Trinidad. In 1580 the English took possession of the island, drawing from it supplies of water and wood for their ships, and for the same purpose the French and Dutch also contended for the ownership, and consequently the island passed several times from the hands of one of these three Powers into those of

another. The first attempt at colonisation was made by the brothers Lampsius of Amsterdam, in 1654, after the Dutch colonists in the Caribbees and the Spanish in Trinidad had been murdered or driven out. In 1673 the English again took the island, but ceded it in 1677 to the French, who by the Treaty of Nimeguen were obliged to restore it to the Dutch. In the next century it was sometimes under the rule of England and sometimes of France, until by the Treaty of Vienna, in 1814, it passed definitely into the possession of the former Power. Several French place-names still remain on the island, and ruins of fortifications near Scarborough and other places recall to mind the wars of bygone times.

With the abolition of slavery in 1838, the prosperity of the island, as of most of the other British colonies, began to decline, and the more rapidly that the hilly ground was not so well adapted as that of the other West Indian islands for the cultivation of the sugar-cane. The population gradually diminished in number till it reached a minimum of 18,000, of whom by far the greater part were Negroes. In 1847 Tobago, with Grenada, Sta. Lucia, and St. Vincent, were formed into the dependency of the Windward Islands, but in 1888 the island was withdrawn from this administrative union and attached to Trinidad. W. A. T.

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

Meetings.

Mr. Daniel J. Rankin delivered a Lecture on the "Commercial Prospects of the Zambesi Basin," and the "Peoples of the Zambesi," at a meeting of the Aberdeen Branch of the Society on the 21st April. The chair was taken by Professor Pirie, and a vote of thanks was proposed by Mr. W. Henderson, and seconded by Bailie Kemp.

Mr. Rankin addressed the Dundee Branch on the same subject on the 25th April.

Mr. Rankin repeated his Lecture before a meeting of the Society in the Lecture Hall, Edinburgh, on the 27th April. The chair was taken by Dr. W. Scott Dalgleish.

Royal Geographical Society.

With reference to the Resolution of Council printed at page 199 of the *Magazine* for April 1893, it is notified that meetings of the Royal Geographical Society will be held in the Hall of the University of London, Burlington Gardens, at 8.30 P.M. on the following dates, viz.:—8th May 1893, 5th June 1893, 26th June 1893.

Tickets of Admission to the above meetings may be obtained by Members of the Royal Scottish Geographical Society who apply for them either personally or by letter at the Offices of the Royal Geographical Society, 1 Savile Row, Burlington Gardens (W.), and produce their Ticket of Membership of this Society.

Admission to the Library of the Royal Geographical Society will be accorded to Members of this Society on presentation of their Ticket of Membership.

The Map-Room of the Royal Geographical Society is open to all persons seeking geographical information.

GEOGRAPHICAL NOTES.

By W. A. Taylor, M.A., F.R.S.E.,

Librarian, R.S.G.S.

EUROPE.

The Ordnance Survey.—The *Report of the Departmental Committee appointed by the Board of Agriculture to inquire into the Present Condition of the Ordnance Survey* has been published as a *Blue Book*. After an account of the history of the Survey and of the methods and processes it employs, the *Report* deals with the three questions laid before the Committee. The first of these is, "What steps should be taken to expedite the completion and publication of the new or revised one-inch map (with or without hill-shading) of the British Isles?" To obviate the inconvenience of delay in the publication of these sheets it is recommended that the practice, lately instituted, of issuing a photo-zincographed advance edition should be continued. The hill-shaded map will, probably, not be completed until 1910, though an advance edition by photo-zincography may be expected in 1900. Sir C. Wilson stated in his evidence that the process of heliogravure would be much more expeditious than engraving, and sufficiently good for hill-shading. The Committee, therefore, recommended that the Survey Department should make an exhaustive inquiry into this process, and ascertain by experiments to what degree of excellence it can be brought.

The second question is, "What permanent arrangements should be made for the continuous revision and speedy publication of the maps?" Seeing that the one-inch map is the one most used for general purposes, it is recommended that its revision should be carried out at all times independently of the larger scales; that the revision should be arranged so that every sheet may be revised within periods of fifteen years; and that each map should bear the date of its revision or correction. Some of the 25-inch plans date from 1855, and have not been revised since. Maps on this large scale get rapidly out of date, and, therefore, their revision should be commenced without delay, and in future the whole series should be revised every fifteen years. As to town maps (scale 1 : 500), it is proposed that, since the work of preparation is continually growing, while the sale of the sheets is very small, the Ordnance Survey should be relieved of this work. The town authorities, it is suggested, should be obliged by statute to maintain and correct a copy of a map executed by the Survey. In the case of new areas outside the existing maps the Survey should be bound to furnish gratis a first triangulation only, and any further work should be done at the cost of the town.

In considering the third question, viz.: "Whether the maps, as at present issued, satisfy the reasonable requirements of the public, in regard to style of execution, form, information conveyed, and price, and whether any improvement can be made in the catalogues and indexes?" the Committee make the useful suggestion that an edition should be issued on thin paper, so that the sheets may be folded and put in the pocket. Many criticisms and complaints are discussed, and some defects are admitted, as, for instance, the incorrect spelling of place-names—a difficulty not

easily overcome. On the whole, however, the Committee holds that the Ordnance Survey has done much useful work, and that the country may be congratulated on the possession of such maps as are executed in this Department.

Denmark.—The Statistical Department in Copenhagen has just published the principal results of the census of February 1, 1890. During the decade, 1880 to 1890, the number of inhabitants has risen from 1,969,039 to 2,172,386, or 10·3 per cent. The proportion engaged in agriculture has decreased from 46·9 to 40·6 per cent.; 24·6 per cent. are engaged in industries, 7·9 commerce, and 2·7 in shipping and fishing. The number of persons in receipt of relief from the public funds rose during the decade from 29,000 to 39,000. Infant mortality has diminished, and the average duration of life increased.—*Deutsche Rundschau*, Jahrg. xv., Heft 6.

Rising of the Baltic Coast.—A correspondent, writing to the *Rigaer Tageblatt*, states that the coast at Libau has risen 50 fathoms during the last 50 years. This might be explained by the emptying of the dredging barges during the construction of the harbour, or might be ascribed to the deposits of sand made by the current flowing out of the lake of Libau into the Baltic and along the coast, were it not that a displacement of the coast line can be shown to have occurred in earlier times. Subterranean forces are probably the agents at work, for in the Kurisches Haff their action is exhibited in the sudden formation of whirlpools. Observations in Sweden, Denmark, and Finland have also proved that the coast rises and falls. At Libau, in 1845 and 1858, when the sea was perfectly quiet, the water suddenly rose several feet, and caused considerable commotion in the harbour. Wrecks were discovered during the construction of the harbour, and according to tradition all the channels around Libau were formerly much deeper than at present, and vessels could ascend the Perkuhn brook to the Castle of Grobin. Very striking movements of the coast line may also be perceived to the north of Libau as far as Sackenhausen.—*Deutsche Rundschau*, Jahrg. xv., Heft 5.

The Marshes of West Russia.—The *Geographical Journal*, Feb., quoting from an official report, states that the swamps of West Russia have an area of 16,000,000 acres. Through nearly 675,000 acres canals have been constructed, with a total length of nearly 2196 miles. Whole rivers and small streams have been silted up. The bottom of Lake Kniaz, hitherto supposed unfathomable, has proved to be 56 feet above the Pripet river. By means of the drainage works more than 800,000 acres have been transformed into meadow-land; nearly 1,200,000 acres of forest, formerly impracticable marches, have been dried, and the transport of timber has been rendered easy. The Pinsk marshes, which on maps cover so large an area on both banks of the Pripet, are obliterated, and their site is occupied by farms.

The Bashkirs and Meshtcheryaks belong linguistically to the Turkish family. The former 757,000 in number, live in the Governments of Orenburg, Perm, Samara, Ufa, and Viatka, and are nomads. The Meshtcheryaks are divided into Russian and Tatar Meshtcheryaks, according as they have mingled with the former or the latter. They number 137,000, and are distributed over the Governments of Kazan, Orenburg, Penza, Perm, Saratof, Tambof, and Ufa. They are in a transitional state, employing themselves to a small extent in agriculture and industries. In the Orenburg Government they are scarcely distinguishable from the Bashkirs. Dr. S. Weissenberg, of Elisabetgrad, has made a considerable number of measurements on members of these tribes, and has arrived at the conclusion that both are of mixed race, and exhibit no traces of distinct anthropological

types. The Bashkirs belong to the Turkish stem, while the Meshtcheryaks are probably of Finnish origin.—*Zeitschr. für Ethnologie*, Heft iv. 1892.

Russian Surveys.—In the *Nouvelles Géographiques*, February 1893, M. D. Aïtoff gives an account of the surveys executed in Russian territory up to 1891, accompanied by a map. The districts surveyed on the scale 1:21,000, on a complete trigonometrical basis and with contour lines, include the western part of Russia in Europe, part of the Crimea, certain portions of the Caucasus, Ferghana, and a few scattered tracts. The surveys of the second order are based on an open network of triangles. The hills are shaded, or represented by curves passing through a small number of points of which the altitudes have been determined. In this manner two-thirds of Russia in Europe have been mapped, as well as the Caucasus, Transcaspia, several parts of Turkestan and of the Governments of Akmolinsk and Semipalatinsk, the districts to the south-east of Irkutsk towards Kiakhta and Verkhne-Udinsk and around Nerchinsk, some tracts along the Amur between Blagoveshchensk and Khabarovka, and, lastly, the valley of the Ussuri. The scales adopted are 1:42,000 and 1:84,000. The degree of accuracy varies with the capacities of the surveyors. Surveys based on points determined astronomically are mapped on scales varying from 1:126,000 to 1:210,000. To these belong the Governments of Vologda, Viatka, Perm, Samara, Stavropol, Erivan, and Baku, the provinces of the Ural and Turgai, a large part of Turkestan, the southern portions of the Governments of Tobolsk and Tomsk and the Ussuri district. Finally, traverses have been made along certain main highways. They are mapped on very small scales, and are not based on any positions determined with exactness. Such work has been executed in the north of Finland and of Russia in Europe, to the north, west and south of Lake Balkash, to the east of Lake Baikal, etc. It would have been better, General Koversky declares, to have left these districts blank.

No topographical work of any description has been executed in the parts of the north of Finland and of the Government of Archangel bounded on the north and north-east by the White Sea, on the south by the lakes Ladoga and Onega, and on the west by the meridian of St. Petersburg, or in the Government of Archangel towards the Ural Mountains, and over fourteen-fifteenths of Siberia.

Two-thirds of Russia in Europe and the Caucasus have been covered with a network of primary triangles, and the lengths of the parallels of 47° 30′ and 52° in European Russia have been ascertained by triangulation (see vol. vii. p. 494, and vol. viii. p. 377). Other series have been laid down, as indicated by the surveys enumerated above, in Turkestan and Siberia. A line of levels has been carried from Cronstadt to Odessa, a distance of 1282 miles, which has shown a difference of level between the Baltic and Black Seas amounting to about 5 inches. Another series has been executed by the Society of Geography of St. Petersburg from Zverinogolovskaia to Irkutsk. Though less exact than the preceding, it has rendered great service to cartography.

As regards the Trans-Siberian railway, the route has been surveyed by the War Department from Tcheliabinsk to Kurgan. Between Kurgan and Tomsk only vague data have been obtained. Beyond Tomsk, as far as Sretensk, an examination of the route was made before 1891, but between this village and Khabarovka the country is almost entirely unknown to cartographers.

Santa Maura.—This island, called in ancient times Leucadia, has an area of 105 sq. miles. The surface is for the most part rocky and mountainous, except where three large plains extend, one near the chief town, another on the opposite

side of the island, towards the south, and the third on the eastern side. These have an aggregate area of about 27 sq. miles. The climate is temperate and healthy, the temperature rarely exceeding 77° F. in summer and never sinking to freezing-point in winter. Snow is a rare phenomenon, while rain is frequent and abundant. The island is separated from the coast of Acarnania by a shallow lagoon 3 miles long, and at one point only 50 yards broad, where the isthmus is believed to have existed over which, according to Thucydides, the Spartan vessels were dragged on their way to Pylus. The whole island is inhabited, and, according to the census of 1889, contains 27,888 persons, of whom 7000 inhabit the town of Santa Maura. The remainder are scattered over the country, and are engaged principally in agriculture, only a small portion of the land being adapted for grazing. Vines and olives are the chief objects of cultivation. Many of the islanders cross over every year into Acarnania to grow cereals, whereby they derive large profits, either owing to the fertility of the almost virgin soil, or because the natural indolence of the natives induces them to let the Leucadians till their farms on the metayer system rather than work themselves. The products of Santa Maura are wine, oil, currants and raisins, cereals, potatoes and fruits, of which the first three are exported in quantities very considerable compared to the area of the island and its population. The wine possesses many good qualities and, when the *Phylloxera* was committing havoc among the vines in France, was much in demand in that country, but now the price has fallen so low that only two or three large firms who are able to charter vessels specially for the trade can gain a profit on it. The olive is very common : it abounds on the numerous hills of the island, and the largest plain, that of Ellomenos, nearly 11 square miles in area, is entirely covered with old trees. The crop is very uncertain, either because of the age of the trees, or owing to unscientific modes of cultivation, and the price accordingly varies. The oil is exported to Venice and Trieste. The plantations of grapes for currants are of recent origin, and have been formed on ground formerly occupied by olives and cereals. The currants are not of the best quality and cannot be compared with those of the Peloponnesus, but with care they might surpass those of Patras and Cephalonia. The greater part is carried ultimately to England and the rest chiefly to France through Trieste. In 1892 the value of the exports was £78,280, and of the imports £36,000, but the latter figure is not representative, for the numerous small indentations of the island and its proximity to the Turkish coast give great facilities for contraband trade.—*Boll. del Ministero degli Affari Esteri*, Jan. 1893.

ASIA.

From Tiflis to India.—Lieutenant Nicolas Leontieff, accompanied by M. Patrin, left Tiflis in September 1891 to ride to India through Persia and Baluchistan. The object of the journey was to explore the route by which Alexander the Great returned from India with a part of his army, while the other part, under the command of Nearchus, made its way home by sea. Passing through Erivan and Nakhichevan, the travellers arrived at Tabris on October 8th, and two days later continued their journey to Teheran, where they arrived on the 19th of the same month, having traversed 764 miles of road in 20 days. Their route across Baluchistan passed through Bampur, Serbaz, Tump, the oasis of Kej, and across the desert of Mekran to Bela. On January 6th the travellers arrived at Sonmeani, and joined a caravan bound for Haiderabad. The character of Baluchistan, the ancient Gedrosia, must have changed considerably since the march of Alexander. At the present day not even a troop of cavalry could find provisions and water sufficient for their needs. Choked up irrigation channels and dry water-courses show that

cultivation existed in remote times. Many of the towns indicated on maps, as, for example, Serbaz, Tump, Kej, and others, are nothing more than groups of tents, and are not permanently inhabited. The people are nomads, and move about according to the seasons and the scarcity of water. M. Leontieff promises to communicate to the Paris Geographical Society a more detailed narrative when he has arranged his material.—*Compte Rendu*, No. 1, 1893.

Japanese Earthquakes.—Dr. A. Supan has contributed a short article to *Petermann's Mitt.*, Bd. 39, No. 1, on the seismic disturbances of Japan, based on reports in the *Transactions of the Seismological Society of Japan*. Since 1885 observations have been extended over the whole realm, and as early as 1887 more than 650 stations were in working order. As regards the alleged increase in the number of earthquakes since 1887, there is some uncertainty owing to the absence of information as to the number of stations, and some allowance must be made for the improved training of observers. The total number of earthquakes shows a very marked increase, but this is principally caused by the inclusion of local disturbances, and may therefore be due to the causes above-mentioned. The records at Tokio, however, where since May 1885 the same kind of seismograph (the Gray-Milne) has been used, show clearly a minimum of subterranean activity in 1886, and a constant augmentation since. Another point noticed by Dr. Supan is that earthquakes are independent of the seasons. The August maximum is produced by disturbances of small extent occurring in the year 1889. The February maximum is the most important, as it occurs in all the curves, but the excess is too small to prove the existence of any seasonal influence, at any rate when based on a period of only five years. The distribution of volcanoes seems also unconnected with earthquakes, which are most frequent and violent on the Pacific side. The districts that suffer most are the country to the west and north of Tokio, and the provinces of Musashi, Shimotsuke, and Hitachi. Higo experienced a severe earthquake in 1889, but that was an exceptional occurrence. Two maps, the one showing the distribution of earthquakes in general, and the other of violent shocks, are appended to the article.

AFRICA.

St. Helena.—The Austro-Hungarian Consul reports that in 1891 the commercial condition of the island did not improve in any direction. The imports consisted of 856 tons of coal and 2060 tons of miscellaneous articles, and the exports of 763 tons of spermaceti, hides, and old metal. The number of vessels visiting the port is growing smaller every year; in 1891 it was 198. The population is decreasing owing to a constant flow of emigration to Cape Colony and Natal. A considerable number of men also go on board the whalers, which call from time to time at St. Helena. According to the census of April 1891, the total population of the colony amounted to 4116 persons.—*Chamber of Commerce Journal*, Feb. 10th.

The Lukenye.—This river, called also the Lukatta or Ikatta, was explored in 1888 by M. Delcommune, who ascended it for a distance of 300 miles. It was also explored by MM. Kund and Tappenbeck in 1885 (see vol. ii. p. 296, and vol. iii. p. 103). Lately M. F. de Meuse has made a journey along the river as far as 23° 40′ east long. Its very winding course stretches from east to west parallel to the Sankuru, from which at one place it is only 30 miles distant. The affluents it receives are only small brooks. Where the Lukenye joins the river Mfini, which drains Lake Leopold II., and along a large part of its course, its breadth is 270 to 320 yards. In its lower course it flows with a velocity of less than 2 knots, and has an average depth of 10 to 13 feet, but farther up, where its bed is contracted,

it attains a velocity of 7 knots. Rapids occur in many places, and in the lower course sandbanks and grassy islands are numerous. Far up the river the sandbanks disappear and the islands are clothed with wood. The banks are everywhere covered, sometimes by low-lying thickets where raphia and oil-palms, reeds and bamboos are the preponderating forms, sometimes by fine forest containing a large variety of trees. In general the banks are low and constantly flooded. A few miles from the river the country is covered with plains and rounded undulations where the short, thin grass indicates a poor and sandy soil. At the farthest point reached by M. de Meuse the river is 38 yards broad and has a depth of 13 feet.

The villages, owing to the marshiness of the banks, are situated away from the river. Four tribes, quite distinct from one another, inhabit this region—the Tomba, the Kolasso, the Tollo, and the Bagombi. The Tomba are found to a distance of 25 miles up the river. They carry on a considerable trade in pottery. Their villages are small but very numerous. Cannibalism is practised by them. The Kolasso succeed the Tomba, occupying the country on both banks. They are distinguished from the latter by a different pattern of tattooing. They are great hunters. Beyond this tribe no trace of inhabitants was observed for a distance of 118 miles. Then the Tollo were met with, a warlike tribe occupying the south bank of the river for a distance of 125 miles. Their country is undulating, and some hills rise to a height of 500 feet. The men of the tribe wear their hair long, falling in two locks over the shoulders. Game they catch with nets of enormous length, and in war they use arrows poisoned with the juice of a *Euphorbiacea*. At 23° east long. the territory of the Bagombi commences, a tribe who speak a language very similar to that of the Tollo. They are acquainted with the Arabs and know that there are white men on the Sankuru, which is only 30 miles distant from their village of Lkolombe.—*Mouvement Géogr.* No. 6.

The Mountains of the Moon and the ultimate Source of the Nile.—Dr. O. Baumann made last year an interesting journey through the country lying between the Victoria Nyanza and Tanganyika. In a letter published in *Petermann's Mitt.*, Bd. 39, No. 2, he states that on August 8th he set out from the shore of the Bukumbi Gulf and, passing through Bukome, marched westwards into Usuwi. On September 23d he crossed the Kagera, called here Ruvuvu, and entered Urundi. Through grassy mountain land, composed, as in Usuwi, of crystalline rocks, with numerous granite dykes, he came to the Akenyaru, which is not a lake but a river forming the boundary of Ruanda. In the latter country Dr. Baumann made many inquiries as to the existence of a lake, but could hear of none. People who knew all the country between the Victoria, Albert Edward, and Tanganyika lakes declared that in Ruanda there was no lake as large as Urigi, and that the Akenyaru was the largest river of that country. Marching in a south-westerly direction, Dr. Baumann re-crossed the Akenyaru a day's march below its source, and on September 19th reached the source of the Kagera (Ruvuvu) in the range that forms the watershed towards the Rusizi valley. The question of a river rising in Uhha and flowing into the Albert Edward Lake (see vol. viii. p. 100) is hereby disposed of. The Warundi bury their kings at the source of the Ruvuvu, and call the mountains *Misozi a Mwesi*, *i.e.* Mountains of the Moon, and the whole country of Urundi is named Land of the *Mwesi* (Moon). Thus another interesting question seems to be settled. Over the watershed, 6500 feet high, Dr. Baumann crossed into the Rusizi valley. The river comes apparently from the north-west, and, according to the natives, flows out of the Kiva (lake?), which lies to the south-west of the Mfumbiro mountains, and is navigable by canoes. Whether the Kiva is identical with the Ozo lake Dr. Baumann was unable to ascertain. The

shore of Tanganyika was reached at Uzigi, and the march was continued over the watershed in a south-westerly direction towards Uhha. The country is watered by the southern tributaries of the Kagera, the most eastern of which, the Luverosa brook, rises at 4° south lat. The watershed between this and the Mlagarazi forms striking climatic boundary ; on the west rain fell daily, whereas on the eastern side no fall had occurred for several weeks. From this river Dr. Baumann passed through the Muhambwe country, marching through thin uninhabited woodlands to Kirambo, the border district of Unyamwezi, and on to Tabora. The bed of the Igombe contained only some pools of water, and Mr. Shaw in Urambo stated that the rivers are yearly becoming poorer in water. It may be that this fact has some connection with the fall of level in Tanganyika. The name Unyamwezi is not of native origin, but has been given to the country by the dwellers on the coast because the Arabs supposed a Land of the Moon to lie in this part of Africa.

Mauritius and Réunion.—The *Deutsche Rundschau*, Jahrg. xv., Heft 5, contains a note on these islands. They lie between 20° and 21° 30′ S. lat., and are completely separated from the neighbouring island of Madagascar by a deep depression, while they are connected with the Seychelles to the north by a series of banks. They are of nearly equal area, Réunion having an area of 764, and Mauritius of 739, sq. miles, and both are of volcanic formation, very fertile, and beautiful. The former has an egg-shaped outline, and consists principally of a plateau interrupted by mountain ranges. Nearly in the centre of the island the Piton des Neiges rises to a height of 10,700 feet, and is carpeted with snow once a year on an average. At the south-east stands Volcan, called also Piton de la Fournaise and Grand Brulé, 9180 feet high, which since 1785 has poured out almost every year large volumes of lava, and is the most active volcano in the African division of the globe and in the Indian Ocean. Mauritius, lying 105 miles to the north-east, has a somewhat more elongated form. In the middle lies a plateau 1000 to 1600 feet above the sea-level, from which the Piton du Milieu rises to a height of 1709. The greatest elevations, however, lie near the coasts of the islands ; to the south-west the Piton in the Montagnes de la Rivière Noire attains a height of 2710 feet, the Pieter Both mountain in the north-west is not much lower, and the Bamboo mountain in the east rises to 2060 feet. The rivers radiate from the interior of the island.

From April to November the south-east trade-wind blows, and the islands receive abundant rains ; the driest months are September and October. Mauritius, in particular, enjoys a very agreeable climate, but is exposed to fearful hurricanes, occurring usually in February or March, one of which caused such terrible destruction last year.

The fauna and flora are peculiar, as on other East African islands. On Mauritius have been found nine, and on Réunion five, endemic dicotyledonous forms. In the upper regions above the forest exists on both islands a bamboo zone, and then follows a vegetation of bush and brushwood. The fauna of the two islands is very similar. Both have peculiar varieties, though many of them have now become extinct, as, for instance, the Dodo, which existed here a century ago. Some singular pigeons and Oriental parrots still live in Mauritius. Lizards, some of Australian type, are numerous on both islands, but reptiles are scarce.

Réunion, or Bourbon, which belongs to France, has a population which in 1888 numbered 165,009, and is composed of Hindus from Malabar, Malays, Negroes, and Mulattoes, the last forming the majority. There is also a European population which has maintained its existence for 200 years, and this fact, together with the regular excess of births over deaths, speaks well for the salubrity of the climate. Réunion, however, with a density of 216 inhabitants to the square mile, is not so

thickly peopled as Mauritius. The trade, chiefly with France, is considerable, and in 1889 the value of the imports amounted to £852,000, and of the exports to £556,000. St. Denis, with 35,120 inhabitants, is the most important town, though it has no harbour, but only an unprotected roadstead. It is rivalled in wealth and population by St. Paul, which is situated in a well-watered plain on the north-west coast. A railway 90 miles long runs from St. Benoit on the east coast round the north and west coasts to St. Pierre.

Mauritius, or Isle de France, has prospered wonderfully since it was taken by the British in 1810, and has far outstripped the more fertile Réunion. Its population is twice as large, amounting, in 1889, to 372,644, or 504 to the square mile. It consists of the same elements as in Réunion, but coolies are the most numerous, numbering a quarter of a million, and hence the males are greatly in excess of the females. The chief products of both islands are sugar, coffee, vanilla, aloe fibres, *copra*, and rum, but in Mauritius the cultivation of sugar has almost driven out that of coffee. The exports in 1888 were of the value of £3,306,000, and the imports were worth £2,661,000. The capital, Port Louis, with 70,000 inhabitants, lies on the north-west coast; Mahebourg, the second town, with 20,000 inhabitants, is situated in the south-east. Port Louis is connected by a railway with Port Savanna or Souillac on the south coast, and another line traverses the north and north-east parts of the island. The total length of railway is 91 miles, and of telegraph lines 180 miles.

The Kerguelen Islands.—This newly acquired French possession lies in 50° S. lat. and 70° E. long. Discovered in 1772 by the French officer, Kerguelen, the group was visited by Cook, and in recent times by the *Challenger* and the *Gazelle*. Of the total area of 180 geographical miles, 129 belong to the main island, which has a remarkable length of coast-line and possesses 15 peninsulas. The islands were formed by a rising of the sea bottom, and are traversed by numerous ridges composed chiefly of basalt. The greatest elevation is Mount Ross, 6166 feet high. Glaciers descend from extensive snow-fields, and show unmistakable signs of retrogression. Trees and bushes are absent, and the vegetation consists of Antarctic mosses, grasses, and ferns. A remarkable plant is the very useful Kerguelen cabbage, *Pringlea antiscorbutica*. The fauna is poor: besides sea-birds, a few insects, spiders, *crustacea*, and a snail are found. Mammals are represented by three varieties of seal and a mouse, the last imported by sealers. The weather is stormy and the rainfall abundant. The mean summer temperature is 41·7° F.—*Globus*, No. 13.

AMERICA.

Costa Rica.—In the *Deutsche Rundschau*, Jahrg. xv. Heft 6 und 7, Dr. A. Olinda, who in 1891 made a long sojourn in Central America, and particularly in Costa Rica, gives an account of this Republic, which he regards as the most progressive and prosperous of the five States of Central America. Their area and population are shown in the following table :—

	Area in Sq. Miles.	Population.
Guatemala,	46,770	1,322,544
Salvador,	7,230	651,130
Honduras,	46,520	380,000
Nicaragua,	51,500	320,000
Costa Rica,	23,160	243,205

It is here seen that Costa Rica takes the last place in population, and the last

but one in area. In density, however, the population of Costa Rica takes the precedence of Honduras and Guatemala. Dr. Olinda's figures are from the census of February 1892, and show that the population is increasing rapidly. According to the census of November 1883, the total number was 203,780 (see *Statesman's Year-Book*), so that the increase in eight and a half years has been 19 per cent.

Costa Rica is a markedly mountainous country, being occupied by two ranges which are separated from one another by the valleys of the Rio Raventazon and Rio Grande, where in prehistoric times, according to M. Pittier, lay an arm of the sea. The one running to the north-west may be distinguished by the name of the Volcanic Cordillera; while the other, which extends in a southerly direction, may be called the Cordillera of Talamanca. The former, which is of more importance in the orographical structure of the land, is composed entirely of eruptive rocks, and falls into two divisions. Of these, one begins at the north-eastern limit of the Republic, and runs almost in a straight line to the south-east, ending in Monte Agnacate, where there are rich gold mines. The highest summits are Orosi, the Rincon de la Vieja, Miravalles, and Tenorio—all volcanoes still more or less active. The other group contains the mountains, Poas, Barba, and Irazu. The last rises to a height of 11,190 feet, and is crowned by a crater wall more than 1000 yards in diameter, wherein are two smaller craters, both now extinct. On the northern flank hot springs and solfataras show that volcanic action has not quite disappeared. From the summit of this mountain, situated in the centre of the Republic, the whole country can be seen from one ocean to the other. The volcano of Poas has been explored by M. Pittier (see vol. vii. p. 501). The central plateau is bounded to the south by small ranges bearing the names of Cerro Turrubales, Cerro Puriscal, and Cerro de la Candelaria, and in the uncultivated and desolate lands to the east stretch the Cerro de las Cruces and the Dota mountains, which, turning southwards, merge in the Cordillera of Talamanca. Here are several high peaks, among them the Pico Blanco, 9558 feet.

The most important rivers—though their commercial importance lies still in the future—are those that flow down the northern slope into the Rio San Juan and the Lake of Nicaragua. Besides the Rio Sapoa, which marks the boundary between Costa Rica and Nicaragua, and enters the lake on its western side, and the Rio Frio, which, traversing the totally unexplored country of the savage Guatuso Indians, flows into the south-eastern corner of the lake, there are three considerable rivers in this part of the State—the San Carlos, the Sarapiqui, and the Colorado. The first-mentioned enters the Rio San Juan at the middle of its course, and is navigable for two-thirds of its length by vessels of no great draught. The Sarapiqui rises on Monte Barba, and by its length, and the few, if any, obstacles it presents to navigation, deserves to be considered the finest river of the Republic. The Colorado is the most southern and largest channel of the delta of the San Juan. To the Atlantic Ocean descend the Raventazon, Pacuare, and Matina from the Volcanic Cordillera, and three streams draining the slopes of the Cordillera of Talamanca which are navigable only by small boats. The Rio Barranca and Rio Grande de Tarcoles carry off the waters of the central plateau to the Pacific Ocean, and the Rio Chiriqui Viejo, also flowing westwards, is worthy of mention as marking the boundary on the side of Colombia. The rivers of Costa Rica are subject to frequent and sudden floods, spreading far beyond their banks, particularly on the Atlantic side, and causing great damage, but this abundance of water is also the source of wonderful fertility.

The journey across Costa Rica, now that three-fourths of the distance may be traversed by train, presents no difficulty. The central section of the railway to San José, in which the greatest engineering difficulties had to be overcome, was

completed in 1891. The starting-point of the line is Puerto Limon, the only harbour accessible to large vessels which the Republic possesses on the Atlantic coast. It is a poor town, chiefly of shanties, situated in the *Terra Caliente*, the strip of land which extends from the coast inland to an elevation of 3000 feet, and has mean annual temperatures of 81° to 95° F. In spite of the trade-wind which blows over these coasts, the climate is very unhealthy for Europeans, probably owing to the exhalations from the neighbouring marshes. For two hours the train runs through flat, marshy country, with plantations of bananas on either side, and then ascends the valley of the Raventazon, which is clothed with dense tropical forest, and contains much beautiful scenery. Higher up the vegetation assumes a more European character, and the mountain masses recall to mind the Thuringian and Black Forests. Still higher an Alpine region is entered where bare, rocky peaks look down on emerald-green meadows, the pasture-ground of large herds of cattle. The culminating point of the railway is at Cartago, 4648 feet above the sea-level. This town, formerly the capital of the Republic, is situated at the eastern edge of the central plateau at the foot of Irazu, and contains barely 8000 inhabitants. It enjoys a uniformly mild climate, for it lies in the *Tierra Templada*, which extends from an altitude of 3000 feet up to the *Terra Fria* at 8200 feet, and has mean annual temperatures of 63° to 77° F. From Cartago the line descends to an altitude of 3723 feet at San José, 93 miles from Puerto Limon, and then passes on to Heredia (7000 inhabitants) and Alajuela (8000 inhabitants). In five years it will be completed to Punta Arenas, on the Pacific coast, and will then, no doubt, contribute materially to the development of the country. The plateau has a climate well suited for coffee, and between Cartago and Alajuela a succession of plantations, where the bushes are shaded by rows of alligator pears, figs, oranges, and medlars, gives the country a park-like character. Coffee is the principal export, and on it the future prosperity of the country will depend. It was exported in 1890 to the value of about £971,480. The other staple exports are bananas, hides, timber, and cocoa ; sugar, rice, and maize are grown only for home consumption.

San José is a pretty town of 39,000 inhabitants, charmingly situated in the midst of an amphitheatre of mountains, and with some pretensions to architectural elegance. But it suffers severely from earthquakes, which occur almost every year.

In its population Costa Rica offers a marked contrast to the other Republics of Central America. In these half-breeds, the offspring of intermarriages between Whites, Indians, and Negroes, largely preponderate, whereas in Costa Rica the white race is more or less pure. This is probably in consequence of the fact that the Spanish conquerors exterminated the tribes dwelling on the plateau, while the other Indians sought safety in almost inaccessible wildernesses, where their descendants still exist. Their number is probably not more than 3000, and will no doubt rapidly diminish when the railways projected for the north and south of the Republic disturb their solitudes. The constitution of the Republic guarantees complete equality before the law to aliens as well as citizens, and freedom of religion and the press. Elementary education is compulsory, and free for all children between the ages of 7 and 14. The finances are in a very satisfactory state.

As regards the political future of Costa Rica and the other Central American Republics, Dr. Olinda is of opinion that they will not accept an amalgamation with the United States, which, they believe, would only contribute to the commercial advantage of that more powerful Republic. A confederacy of the five Republics may be formed, and attempts have already been made in this direction, but have

failed, owing to the claims of leadership set forth by Guatemala. The Government of this State is a despotism under republican forms, and finds little sympathy among the other four. Dr. Olinda maintains that Costa Rica, with its intelligent and energetic population, is best fitted to assume the hegemony of the confederacy.

MISCELLANEOUS.

The **Railway in China** from Tien-tsin to Taku has been prolonged to the San-ho, and has now a length of 129 miles. Another section to Kai-ping is in course of construction.—*Globus*, No. 14.

Dr. A. Philippson, who has done such excellent work in the Peloponnese, has started on another journey to Greece, his field of exploration on this occasion being Central Greece and Thessaly.—*Petermann's Mitt.* Bd. 39, Heft 3.

The **Hawaii Islands**, over which the United States has assumed a provisional protectorate, are eight in number. Their total area, according to the *Mouvement Géographique*, No. 5, is 6193 square miles, and their population numbers 89,990.

A **telegraph cable** has been laid from **Marseille to Tunis**. Its length to Biserta is 745 miles. Thence it passes on to La Goulette and to the lake at Tunis. Crossing the lake, a distance of 8½ miles, it reaches the principal office of the Tunis lines.

A large number of the inhabitants of **Iceland** are meditating **emigration** to the north-west of Canada. The Government of Manitoba is already making preparations for the settlement of 2000 Icelanders, who are expected to arrive in the course of this year.—*Deutsche Rundschau*, Jahrg. xv. Heft 7.

The British flag has been hoisted by Captain Gibson of the *Curaçoa* on the **Ellice Islands**, lying to the south-east of the Gilbert archipelago. The largest of the islands, Funafuti, is inhabited by 800, and the smallest by 200, natives. The only exports are coco-nuts and *copra*.—*Deutsche Rundschau*, Jahrg. xv. Heft 7.

M. Feillet, Governor of St. Pierre and Miquelon, has turned the **Negretti-Zambra deep-sea thermometer** to a very practical purpose. Two skippers, to whom he gave instruments, report that there is a great variation of temperature on the bank of Newfoundland, and that there is little chance of finding fish in water at a temperature of less than 43° F.—*Revue Fr. et Exploration*, March 15th.

Dr. Fleck has visited the **Ngami Lake**, and though he was unable, owing to the opposition of the natives, to execute a regular series of soundings, he has ascertained that its depth is small compared with its area, being, probably, only about 10 feet. Such large shallow lakes have existed in this country, according to Dr. Fleck, perhaps even within historic times. There are many indications that the lake formerly covered an area compared to which its present extent is insignificant.—*Globus*, No. 13.

After many delays and difficulties the **canal across the Isthmus of Corinth** is approaching completion. Its breadth is 24 yards and its depth 26 feet. The bottom has been almost entirely laid bare, and the rest of the work is to be finished by the end of the year at the latest. The traffic cannot be very great, for ships, except those sailing from Adriatic ports, will take this course only in bad weather when the passage round Cape Matapan is dangerous.—*Deutsche Rundschau*, Jahrg. xv. Heft 6.

According to a letter from Mr. Bent, dated March 7th, his expedition to Axum has come to a sudden conclusion. On his arrival at Massowah he found that war was going on between Ras Mangasha and Ras Alula, which rendered it impossible for a stranger to enter Tigre. At length, Ras Alula having been defeated, Mr. Bent was able to examine an ancient Himzaritic temple near Adowa and to spend a week at Axum, when, owing to renewed hostilities, he was obliged to make a hasty departure. He has, however, done some important work.—*The Times*, April 1st.

NEW BOOKS.

The Partition of Africa. By J. Scott Keltie. London: Edward Stanford, 1893. Pp. 460. Two Appendices, Index, and 21 Maps. *Price* 16*s.*

Mr. Keltie's knowledge on the subject of Africa is well known, and the position he so long held as Librarian to the Royal Geographical Society led us to expect from him a masterly exposition of a difficult subject. Nor are we disappointed, for this volume is one which fitly marks a definite epoch in African history. It will probably be said by some that, when writing on the partition of Africa, it was quite unnecessary to refer to ancient history, and had Mr. Keltie simply written an account of the last hundred years of African history he would have done all that could possibly have been required of him; but had he done so we should have lost the first 84 interesting pages which connect the main subject of his volume with the past history of the continent. In the first six chapters our author traces the relations with Africa of what he calls the outside world, from Egyptian times downwards. We have not space to refer to these chapters, and will only say that they are concise and interesting, and enriched by the reproduction of 12 maps of the greatest interest to the student of African geography—maps inaccessible to the majority of readers and making the acquisition of Mr. Keltie's book desirable for their sake alone.

This book does not deal with either a history of African exploration or with the geography of the continent, although incidentally these matters are referred to. It may be said in passing that the book forms an admirable complement to *The Development of Africa*, which was written by Mr. A. Silva White, the late Secretary of our Society. In three chapters (vii. to ix.) a *résumé* is given of the events which happened between the years 1815 and 1880. Mr. Scott Keltie shows the position occupied by the various nations in regard to Africa, and points out that, at any rate during the first fifty years, it appeared unnecessary to British statesmen to definitely appropriate very extensive regions in Africa. In those days the markets of the world were not glutted, commercial rivalry among great States was not intense, and there was no necessity, apparently, for securing new fields for industrial enterprise. In fact, as a colonising Power we were supreme, and practically without a rival. It was only after 1870 that Germany commenced to entertain ideas of colonisation, and it is since that date, and after Mr. Stanley's journeys in Africa, that European nations have vied with one another in schemes of annexation and exploitation. The whole of these preliminaries to partition are touched with a light but accurate hand; and then follows a readable chapter on France and Portugal on the Congo, reference being also made to the trans-Saharan railway which France has long meditated and will probably eventually carry out.

When dealing with the British advance from the south and east, between the years 1875 and 1884, the author has apparently been pressed for space, and the

result is that his account is far too condensed, and is perhaps the least comprehensible in the book. He is far more at home in his description of Germany's entrance into the African struggle, and he deals with German aspirations and annexations both in the Cameroons and on the east coast of Africa, not only at length, but in a most satisfactory manner, although perhaps he shows a little bias. A quotation may be permitted here, showing the author's opinion regarding German action in 1885 :—"The worst we can say of Germany's action is that she stole a march upon us, which, according to accepted standards, can hardly be regarded as immoral either in business or diplomacy—in neither of which is chivalry supposed to hold a place. But even if we could have forestalled Germany in her East African annexations, would it have been wise to do so? Half the region is desert or but little removed from it, although there is no doubt ample room for plantation settlements. Would it have been wise in England to monopolise a tropical continent which she could never colonise with her own people, and which could therefore never be a source of real strength to her? The co-operation of a nation such as Germany in the development and civilisation of the continent cannot but be to our advantage as well as to theirs. There were then, as there are now, many reasons why we should be on friendly terms with our Teutonic kinsmen; and at that particular moment the Egyptian question left the British Government with only one hand free to take part in the scramble for Central Africa. It was perhaps, then, the wisest course to welcome the Germans to East Africa."

The description of the founding of the British East Africa Company is good and accurate, as is also the description of events that have taken place in Uganda, and which is brought down to date. We have not space to refer to Mr. Scott Keltie's description of the struggle for the Niger, nor to the Italian sphere of influence, the Egyptian Soudan, Zambesia, or South Africa. Suffice it to say that, as far as we have been able to test the information given, it is accurate and well condensed. We must in conclusion, however, refer very briefly to Chapter XXII., which is upon the economic value of Africa. It is truly remarked that without labour we cannot develop the continent of Africa. At the same time, the author believes that, notwithstanding the unwillingness of the people to work, it will be possible, eventually, to lead them on to industrious habits. Mr. Keltie points out that the present products of Africa will only yield a fair amount of commerce, and that it will be necessary, not only to develop the natural resources of the country, but to introduce new plants for cultivation. Apparently Mr. Keltie does not believe in colonisation—at any rate, he cries for more knowledge before hazarding an opinion; still he confesses that, as unattached pioneers, no young men with sound constitutions to start with need hesitate to go and settle at various favourable stations over the centre of the continent.

We must take leave of this book now, although much more might be said about it. It will be indispensable to all students of Africa, to philanthropists, and to statesmen. The maps are very excellent.

In Arctic Seas: The Voyage of the "Kite" with the Peary Expedition, together with a Transcript of the Log of the "Kite." By ROBERT N. KEELY, Jr., M.D., and G. G. DAVIS, A.M., M.D. Philadelphia: Rufus C. Hartranft, 1892. Pp. 524.

In this handsome volume we find a narrative of two important expeditions: first, that of 1891, when the *Kite* conveyed Lieutenant Peary to the north-western shore of Greenland; and the Peary Relief Expedition in 1892, forming the second voyage of the *Kite*. This now celebrated vessel, an Arctic steam-

whaler and sealer of 280 tons, sailed from Brooklyn, New York, on 6th June 1891, with Lieutenant R. E. Peary of the Navy Department, U.S.A., his wife, and a scientific staff. Captain Richard Pike (a Newfoundlander) commanded the ship, and set its course first to Sydney in Cape Breton, and thence northwards to Godhavn in Greenland, which was reached on 25th June. The party was hospitably entertained by the Danish Governor, but the first sight of the Eskimo disappointed them. These people are "well behaved and honest, and spend their time in the spring catching seals and walrus, and obtaining skins, ivory, and oil, which are sent to Denmark." But their filthy costumes and odour of grease and fish-oil make the natives repulsive to strangers. The religion of the Eskimos is "somewhat indefinite and uncertain." They cannot grasp the idea of a Deity, of original sin, or of hell. Their attendance on the Lutheran chapel at Godhavn "is due largely to their great passion for music. They never tire of the music of the small organ, and singing to its accompaniment affords them the greatest pleasure."

On 29th June the *Kite* left Godhavn, and sailed 180 miles north to Upernavik, where a *Notice to Mariners in the Davis Straits*, issued by the Danish Government in 1884, was handed to Captain Pike. According to this notice the west coast of Greenland, between lat. 60° and 73°, is closed against all ships, except by special permission of the Danish Government, "by whom the monopoly of trade with Greenland is held." The last Danish settlement is Tussiacic, 25 miles north of Upernavik, and beyond it "Denmark has no jurisdiction or representatives."

"The Devil's Thumb," a well-known landmark (2347 ft. high) on the Greenland coast, was next passed, and then ice closed in round the *Kite*. The ice was 6 to 8 feet thick, and movement became impossible except by drifting with the pack, which suddenly loosened after the *Kite* had been imprisoned for days. On 11th July Lieut. Peary broke his leg by the ice striking the vessel and entangling him in the rudder chains. Although completely disabled, he gallantly determined to go on with his expedition.

By "butting" or forcing its way through the heavy ice the *Kite* reached Cape York; and there the weather became warm and sunny, and there was plenty of sport, as thousands of birds were seen in every direction. Passing Cape Parry, Whale Sound was entered, and an Eskimo village was visited. The Eskimos here ate no vegetables, being entirely carnivorous. Their teeth showed no signs of decay. They were perfectly contented, very friendly, and indescribably filthy.

On 26th July the expedition began to build its winter quarters at M'Cormick Bay (lat. 77° 43′), calling its house "Red Cliff House." Here the *Kite* left the expedition, and sailed home to America. The party spent the autumn and winter of 1891 and the spring of 1892 at Red Cliff House. Lieutenant Peary quite recovered from his accident. On 8th November the long Arctic night set in, and the darkness of midnight reigned for three months. On 15th February 1892 the party saw the first sunrise, and on 3rd May they started for their long journey over the inland ice northwards to the Arctic Ocean. The "true inland ice" was not reached till 14th May, and thereafter the party marched "over its gradual and easy incline." Petermann Fiord was reached on 31st May, and the thermometer registered 77° in the sun at noon. By the 26th June the 82nd parallel was reached. On 4th July the north-eastern extremity of Greenland was attained, and in honour of the day a bay of the Arctic Ocean, discovered by Peary, was called "Independence Bay," and the American flag was unfurled on a cairn.

Next day (5th July) Peary and his friends started to return home, and curiously enough on that very day a Relief Expedition sailed in the *Kite* from St. John's to

go to their rescue. Still more curiously, the Relief Expedition reached Red Cliff House only a few days before 5th August, when Peary and his party, radiant with health and success, marched into it. He was warmly welcomed and congratulated by Professor Heilprin, the leader of the Relief Expedition, whose journey is also detailed in the volume before us.

As a contribution to our knowledge of Greenland and its inhabitants, this volume must be regarded as most striking and valuable. As affording important information for Arctic travellers it will hold a high place. It is embellished by many fine illustrations, but it contains no index, and only a sketch-map.

Nomina Geographica: Sprach- und Sacherklärung von 42,000 *geographischen Namen aller Erdräume.* Von Dr. J. J. Egli, Professor in Zürich. Zweite, vermehrte und verbesserte Auflage. Leipzig: Friedrich Brandstetter, 1893. Pp. viii + 1035.

We have great pleasure in notifying the completion of this laborious but excellent undertaking, the work of half a lifetime, by a very careful and conscientious worker. Dr. Egli has paid our two previous notices (see vol. viii. p. 393, and vol. ix. p. 51) the uncommon compliment of a special epilogue, with which he concludes his book. We were unable to understand quite what principles Dr. Egli had gone upon in making his selection of words to be treated of; and illustrated the nature of the difficulty we felt by contrasting certain words found in the book with certain other words, of a similar class, which we failed to discover in it. Dr. Egli now states, and states, we freely acknowledge, as fully and as satisfactorily as could be desired, the grounds that did determine him in making his selection. As a rationale of method it is logical and eminently suited to the peculiar conditions of the problem he had to deal with. Nevertheless, whilst we ungrudgingly grant this much, we are bound to state that we are not quite able, in every case that we have noticed, to reconcile the author's practice with his theory. Take, for instance, Durham. It strikes us that the reasons he adduces for excluding that name hardly differ in kind or degree from those which would seem to have determined him to include Berlin and Zollern. In all three cases alike there is considerable conflict of opinion amongst authorities, and a resultant uncertainty of explanation. And we remarked something of the same kind in five other instances, which we picked out as examples, and ventured to commend as illustrating Dr. Egli's prudence in suspending judgment and abstaining from a decisive verdict upon the merits of the respective explanations that he cites. Why did he not apply the same rule to Durham? We have, however, no desire to insist upon this feature. We realise to the full the extremely difficult task Dr. Egli set himself; and in face of the admirable manner in which he has met and overcome that task, it would be both presumptuous and unjust to dwell further upon what is perhaps after all a difference of opinion.

The concluding third of the book, which we now have before us for the first time, maintains the same standard of accuracy and thoroughness that marked the earlier portions. Amongst the most instructive as well as the most comprehensive articles, we may cite Schleswig, Sjaeland (Danish Zealand), Siebenbürgen (Transylvania), Stanley, Sverige (Sweden), Tibet, Utrecht, Walen and Wales, Wien (Vienna), York. Articles like Spalato and Tibet show how wonderfully abreast of modern learning Dr. Egli has kept himself. Spencer's Gulph is not, however, an English form; it should be Gulf. Godwin-Austin, we may add, is the name given in 1888 to the Himalayan peak designated in the great trigonometrical survey of India as K2.

New Zealand for the Emigrant, Invalid, and Tourist. By JOHN MURRAY MOORE, M.D., F.R.G.S., F.R.C.I., etc. London: Sampson Low, Marston, Searle, and Rivington, Limited [Sold by the Author, Canning Street, Liverpool, and by Andrew Elliot, Edinburgh], 1890. Pp. xiii + 253. *Price* 5*s.*

This is a volume of solid worth, and will prove invaluable to the visitor to New Zealand, whether he be in search of work, health, or pleasure. Everything connected with the colony is viewed in a calm, thoughtful manner, and discussed with due knowledge and without the high colouring and exaggeration of the emigration agent or speculator. No better testimony to the value of the book as a guide to the valetudinarian need be sought than the unsolicited opinion of such an authority as Sir Andrew Clark, who writes :—"In the extent, variety, and accuracy of the information which it conveys ; in the acuteness of its observations ; in the frankness and impartiality of its comments ; in its dealings with the drink trouble ; in the soundness of its judgments ; and in the excellence of its literary form, the book is one of the best of the kind with which I am acquainted." This is high praise, coming from such a source ; and we fully indorse it. Sir Andrew's opinion might be aptly applied to all the descriptions of the varied aspects of New Zealand life. The author is markedly original in the treatment of his subjects : the division of the colony into climatic zones, with descriptions and advice regarding each, is entirely new and of great interest and importance ; as are his full accounts of the diseases cured, or likely to be cured, by a visit to the islands, with a full and intelligent description of the baths and mineral waters. The advice and warnings to intending emigrants are excellent, and ought to be studied by all who are seeking an outlet for their energy in a new England. There are useful notes on prices, wages, outfits, furniture, land, production, industries, social and professional life, public works, and government, with lively accounts of the author's experiences, and vivid descriptions of places and native manners and customs. It is an excellent volume—one that ought to be carefully and thoughtfully read. It is embellished with small but clear maps, and has a full and reliable index.

Idle Days in Patagonia. By W. H. HUDSON, C.M.Z.S., Author of *The Naturalist in La Plata*, and Joint-author of *Argentine Ornithology.* Illustrated by Alfred Hartley and J. Smit. London : Chapman and Hall, Ltd., 1893. Demy 8vo, pp. 256. 27 Illustrations. *Price* 14*s.*

We had been thinking of Mr. Hudson as the Richard Jefferies of the Pampas, and began to read of his *Idle Days in Patagonia* with that feeling of expectant pleasure which *The Naturalist in La Plata* has raised in so many minds. We have not been disappointed. Here again we have the penetrating observation, the poetic feeling, the beautiful style, and the "humanness" of Jefferies, while there is also a stronger power of scientific analysis and a robust joy in which the note of sadness is lost.

Mr. Hudson begins by telling us of the accidents which befell him at the outset of his explorations in Patagonia, and forced him to spend many idle days. That he made so much of his idle days is not surprising, for to have nothing to do is often the condition of doing something well. The more general chapters in the book describe the influence of the miscalled "Black River" (Rio Negro) on those who dwell on its banks; man's war with Nature in that strange desert country; the conflict of human races, and how the wildness of the plains, entering into the soul, rouses the savage, "the old man," who slumbers within each breast. The author's first sight of snow led to thoughts on the quality of whiteness in things living and dead, and on this subject he has given us an interesting essay, of which the general

conclusion is that the strange effect of whiteness on the mind is due to a lingering "animism." We should be inclined, however, to believe that great masses of white —of snow, of cloud, of foam—owe their impressiveness to physiological as well as psychological conditions. Mr. Hudson gives a beautiful account of one idle day, during which he frightened the simple-minded coots, disturbed a whole colony of leaf-cutting ants, burned the inflammable *Escandalosa* bush, and played other naughty tricks, till the derisive laughter of the birds made him blush. Ornithologists will be interested in the account of bird-music in South America; for, unlike Mr. Darwin and some others, Mr. Hudson ranks it very high, and finds the melody of an English wood "somewhat tame" in comparison with the power of the forest orchestra. In a chapter on sight in savages, the author corrects the prevalent opinion that the power of vision in civilised men is far inferior to that of those native to the forests and plains; for sight is in every case relative to given conditions of life, and a savage out of his wonted environment acquits himself no better than we should do on the Pampas. Then follows an ingenious essay on the colours of eyes, and the concluding chapter discusses the problems raised by sensations of fragrance—the case is the perfume of an evening primrose—which are so rapidly forgotten, but which bring with them such a wondrous emotional byplay when they are at rare intervals revived.

Apart from its interest, the book is worth reading for its style alone; it seems to us that—if we must specify—the last few pages of "War with Nature" form a remarkable addition to the treasury of English prose. The book is well printed; there are good zoological illustrations by J. Smit, especially that of the eagle-owl, and clever pictorial sketches by Alfred Hartley.

Excursions in Greece to recently explored Sites of Classical Interest. By Charles Diehl, Professor at the University of Nancy. Translated by Emma R. Perkins, with an Introduction by Reginald Stuart Poole, LL.D. London: H. Grevel and Co., 1893. Pp. xxiv + 408. *Price* 7*s.* 6*d.*

Several excellent books have recently been published in England with reference to the interesting results of the excavations which have been actively carried on in Greece during the past twenty years. The more notable have been Schuchardt's epitome of Schliemann's voluminous reports of his painstaking explorations and valuable discoveries; Louis Dyer's thoughtful lectures on *The Gods of Greece*; and Professor Gardner's *New Chapters in Greek History*. Each of these is good in its own way, and has utilised the data that have been acquired for the elucidation of problems affecting the history, character, and religious beliefs of the Greeks. But there was room for a popular comprehensive work, giving a brief, clear account of the excavations as a whole, with a summary of the actual discoveries, and at the same time calling attention to the light that has been thrown by them on the development of Greek art. This has been well supplied in Mr. Diehl's book. It is distinctly a popular work, written not for scholars and experts in archæology, but for all who take any interest in history and art, and who wish to know what the research of explorers and scholars has yielded to make the past living and intelligible. Mr. Diehl's aim, as he himself says, has not been to draw up a bare catalogue, but to compose a picture which will have life and speak intelligibly to all. Details are not wanting, but they are not allowed to become wearisome or to obscure the general impression intended to be conveyed; they are given with the clearness of exposition, lightness of touch, and charm of style so commonly found in French writers, while the questions raised by the discoveries are so handled as to be full of interest for all who seek for light on the progress of humanity in the

past. Separate chapters are devoted to the excavations at ten sites. In regard to four of these—Dodona, Delos, the Temple of Apollo Ptoios, and Tanagra—information is given which is not to be found anywhere else in a popular form. The translation has been admirably executed; it is true to the original, and yet done into idiomatic English. The plans in the original work have been re-drawn for the translation, and in the latter there have been added forty-one illustrations which, though they have done service before and are in some instances rather roughly executed, are really helpful.

Fossil Plants as Tests of Climate. (The Sedgwick Prize Essay for the year 1892.) By A. C. Seward, M.A., F.G.S. London: C. J. Clay and Sons, 1892. Pp. 151. *Price* 5*s.*

Geologists have generally assumed, when dealing with questions relating to Climate and Time in past periods of the earth's history, that the organic remains belonging to extinct genera of the animal kingdom rarely, or never, afford us any trustworthy evidence with regard to the climatic conditions under which the animals lived; while they may generally be employed with tolerable confidence as measures of geological time. On the other hand, it has commonly been supposed that while the remains of plants afford unsatisfactory evidence upon this latter point, yet, in the great majority of cases the facies of any given fossil flora may be trusted as indicating, in a general way, the nature of the climatic conditions under which that particular flora existed.

Of late, however, it has been shown that, within certain limits, the nature of the vegetable remains found in any group of rocks may be taken as an index to the geological position of the strata that contain them; while, as regards climatic conditions, our faith in the value of their evidence has been considerably weakened as our knowledge of the subject has increased.

The author of the book before us has fully realised these difficulties, and has brought together a mass of information bearing upon each side of the subject under consideration, giving each author's views a fair share of attention, and then leaving the reader to draw his conclusions from the facts himself. Chapter v. deals with the subject of the annual rings in recent and fossil plants, and is of especial interest in connection with the flora of the Lower Carboniferous rocks of Scotland. It has long been believed that the absence of obvious rings of growth in some of the fossil trees from these rocks might be trusted as an indication of a much smaller annual range of temperature in those times than obtains here now; but the author gives reasons for doubting the accuracy of this view.

Chapter vi. deals with questions of hardly less interest and importance, relating to the Deuterozoic floras occurring within the Arctic circle.

Chapter vii. deals with the Carboniferous flora yielded by rocks outside the Arctic circle, and summarises the views of various writers upon the climatic conditions that have been supposed to prevail in different parts of the world during that period.

It should be mentioned that the author assumes that the materials of which coal seams, etc. consist, actually grew upon the spot, and has evidently been unmindful of the fact that, if the vegetable matter had drifted into its present position, as some geologists are again beginning to believe, certain of his conclusions would need to be modified considerably.

Taking the book altogether, it may safely be recommended to the careful attention, not only of geologists, to whom it is chiefly addressed, but also to the biologist and the student of botanical geography.

Opals and Agates; or, Scenes under the Southern Cross and the Magelhans: being Memories of Fifty Years of Australia and Polynesia. By NEHEMIAH BARTLEY. With nine Illustrations. Brisbane: Gordon and Gotch, 1892. Pp. xii + 310. *Price* 15*s.*

In spite of its faults, patent upon the face of it, we have read Mr. Bartley's volume with a very considerable amount of interest, and can well imagine that its contents will be eagerly welcomed and perused by veteran colonists who remember the days of the great Australian gold rush. The volume is full of out-of-the-way incidents and amusing and frequently instructive reminiscences of old colonial life, habits and customs, with an important contribution regarding the birth and growth of Queensland as a separate colony. Mr. Bartley's experience has been wide, and his numerous and incongruous occupations are characteristic of the place and times of which he writes. Any one who, during fifty years, found himself at one time or another following such varied pursuits as those of supercargo, bank-clerk, sheep-drover, general agent, gold-miner, commercial traveller, store-keeper, and land-owner—all in a comparatively new country—must, it is evident, have had many experiences worth recording, as well as very many more quite unworthy of notice. Too many of the latter appear on the author's pages, and without them the book would have been more readable. Mr. Bartley promises a further instalment of his recollections, should his present work meet with a favourable reception. We should welcome such a volume, as, doubtless, the experience gained in preparing the pages under review would result in an improved arrangement of matter, an absence of wandering from one subject or place to another and back again, and attempts at fine writing, all of which, to some extent, mar this memoir. There are, besides, some slips in grammar, and an irritating habit of referring to people, whose full names have once been given, by their initials only, thus causing a doubt as to the person referred to, and necessitating frequent searches to make quite sure of the point. Some sentences are so Pepysian in their quaintness that we would not willingly have missed them; such are "Burnett, the blonde moustache surveyor," and "He was somewhat addicted to bad puns, but otherwise of a kind and genial disposition." All who have had any experience of Australian life will, we feel sure, welcome this volume.

Hinduism and its Relations to Christianity. By the Rev. JOHN ROBSON, D.D. New Edition. Edinburgh and London: Oliphant, Anderson, and Ferrier, 1893. Pp. xvi + 269. *Price* 3*s.* 6*d.*

This is a new edition of a work which originally appeared in 1874, and which aimed at giving a clear, faithful, and intelligible account of Hinduism as it actually is, of the faith and practice of its adherents, of its relations to Christianity, and of the reforming movements of modern times. The scheme was carried out with unquestionable ability and success, and the result was to give in a popular form as good an account as can anywhere be found of Hinduism as it appeared to a thoughtful observer who had been for many years in intimate relations with Hindus and a student of their creeds. The prominent features of the system were clearly explained, and a clear exposition given of the philosophical theories or assumptions which underlie the faith even of the unlettered. In the revision to which the author has subjected his work in consequence of a recent visit to India, he has largely supplemented and brought down to date the account of the attempts at internal reform provoked by the struggle with Christianity. The brief introductory sketch of earlier religions does not pretend to be exhaustive or to be a contribution to the science of religion, but it gives evidence of a serious and thoughtful endeavour to under-

stand the development of the modern system, and it will be found to give an attractive and apparently successful explanation of some features of it which at first sight seem so unreasonable. Such features, for instance, are the numerous incarnations of Vishnu and the many incongruous forms and attributes of Shiva. One or two minor points may be noticed which have escaped correction in the revision. Dr. Robson speaks of the "mimosa" tree under which Buddha found the truth. Surely this famous tree was a pipal-fig? Again, on page 174, Dr. Robson seems to forget that though the Punjab is in the north-west corner of India, it is not a part of the territory that is subordinate to the government of the North-West Provinces; and to speak of it as such is misleading.

The Kelt or Gael: his Ethnography, Geography, and Philology. By J. de Courcy Atkins, B.A., Barrister-at-Law. London: T. Fisher Unwin, 1892. Pp. 96.

Perhaps owing to the restricted limits of the book, the author contents himself with a very summary treatment of the ethnographical and geographical sections. He deals in very wide, comprehensive statements, without entering into detail, and without reference, as a rule, to other authors. He has satisfied himself that all the nations of Europe belong to one and the same race. Differences of size, complexion, or colour of the hair are of no importance, as dark-haired parents occasionally have children some of which are dark, while others are blonde. The difference between brachycephalic and dolichocephalic skulls is not even alluded to. The Celtic area is made to include the whole of Gaul, North Italy as far south as Latium, and everywhere south of the Danube, from its source to its mouth, save the Greek peninsula. By this sweeping assertion non-Celtic peoples like the Thracians and the Getoi are gathered without a word into the Celtic net. And, in spite of the well-founded doubts of several French ethnologists and men of letters, the Gauls and Celts are asserted, without a shadow of doubt, to be the same people. The author never admits, or even seems to suspect, such a thing as a word borrowed from one language into another. Irish and Welsh words, like *aingeal*, *altair*, *aradr*, *porcan*, *airgid*, *ariant*, *beannacht*, *bendyth* (sic), *caisc*, *caws*, and a host of others which have undoubtedly been borrowed from the Latin, are treated as original Irish or Welsh words, all tending to prove that Latin is a Celtic dialect.

Mr. Atkins has devoted so much time to Celtic studies, and so little to the history of his own language, that he seriously assures his readers that most of the English pronouns and the word to *be* are not Teutonic, but Celtic. *I* is Welsh; *he*, *she*, *our*, *your*, *their* are Irish; *my*, *thy* are Celtic, though *mine*, *thine* are German; *thee*, *ye*, perhaps *we*, are Cornish. With regard to *his*, Mr. Atkins reserves his opinion. Though the author speaks all the Gaelic dialects, knows Welsh, and has read the grammars of Zeuss and Windisch, he is unable, in the two chapters devoted to an outline of Irish and Welsh grammar, to give an explanation either of the aspirated letters or of eclipse in Irish. He actually believes that in *ar mbeatha* the *b* is eclipsed because it is not found easy to pronounce this letter after an *r*! After this it is not surprising to find such extraordinary equations as these: W. *dyfr* (sic) with I. *tobar*, and both with the river names *Ebro* and *Tiber*; Gr. *boulê*, *theos* with W. *pwylla* (sic), *Duw*; I. *ór* (gold), *tiune* (fire), with E. *ore*, *thunder*; I. *fein* (self) with Fr. *même*. This list might be enormously increased. An Etruscan inscription is, of course, mere child's play to Mr. Atkins, and he readily guesses one to mean, "Lars the fifth of the Aruns and the Clan Cechase—probably the Irish name of Casey."

A Text-Book of Tropical Agriculture. By H. A. Alford Nicholls, M.D., F.L.S., C.M.Z.S. London: Macmillan and Co., 1892.

This attractive and valuable manual on Tropical Agriculture has recently been published in this country after a first appearance in Jamaica, where it was originally issued by the Government of that dependency. It first obtained notice as a prize essay, and was by request extended into the volume before us. It is divided into two parts: the first dealing with the soil, climate, manures, drainage, irrigation, tillage, rotations, plant-life, etc.; the next with the products of cultivation, under which tropical plants, such as coffee, tea, cacao, sugar-cane, fruits (of many kinds), spices, tobacco, drugs, dyes, food plants, etc., are interestingly described. At the first glance it would seem as if too much had been attempted in the limited space of some 300 pages, but a perusal of the volume shows that it is in reality what it purports to be. The author in the preface says he found it "necessary to enter upon details, which to the tropical agriculturist may appear superfluous; but the book is really intended as a guide for the young and the unlearned, to whom such details are likely to be of service." It contains no unnecessary padding or verbiage, such as is too often found in the modern text-book. Every sentence has its tale to tell in a readable, simple, and interesting way. The science introduced is sound, and the description of the various practical operations carries home to the mind of the reader the impression that the author knows from experience what he writes about. The letterpress is illustrated by engravings of the coffee, the cacao, the tea, the orange, the nutmeg, the chinchona, the rice, and the tania plants, copied from the *Guide* to the Royal Gardens at Kew; and indebtedness is acknowledged to Mr. Morris, Assistant-Director of the Gardens, for editorial assistance. The work is one which, from every point of view, can be confidently commended to the notice of the student of tropical agriculture.

Fruit Farming for Profit in California. By Dwight Whiting. London: Griffith, Farran and Co., 1893. Pp. 111. *Price* 1*s.*

This is a book of a very different class from the manual above referred to. It is simply a trade advertisement intended to puff, in the usual bombastic style so well known to American traders, a fruit ranche in Southern California which the gentleman wishes to dispose of. Like much of the literature which is sent broadcast among ignorant innocents, who contemplate emigration, its teaching should be received with caution, and its high-coloured statements discounted at a very small fraction of the face value. Nevertheless, with the exception of its financial details, the little book gives some information which may be of interest to those who can spare the time to read it.

The Goal of the Human Race; or, the Development of Civilisation, its Origin and Issue. By the Rev. Dr. R. F. Grau, Professor of Theology at Königsberg. Translated by J. G. Deimler and W. St. Clair Tisdall, M.A. London: Simpkin, Marshall, and Co., 1892. Pp. xiii + 252. *Price* 5*s.*

This work, the original of which appeared in 1875, traces the progress of civilisation "mainly from an ethnical and psychological standpoint," and shows its failure to realise the goal of the human race, which is fulfilled in the "coming of the True Second Adam, the true Son of God," to unite mankind in holiness and reconcile them to God. It is a continuation of a former work on *The Semites and Indo-Europeans in their relation to Religion and Science.* But this new volume is rendered less effective by a fanciful application all through of what the author calls the third and not less important factor in the history of mankind, the Hamites.

Professor Grau has a Hamitic craze which vitiates much of the power as well as of the undoubted learning of the volume. The tone and the aim of the book are, however, alike admirable. It is dedicated to Sir Monier Monier-Williams, K.C.I.E., who remarks that our success in promoting Christianity among non-Christian peoples, especially in India, depends on our acquaintance with the development and present condition of non-Christian religions and philosophy.

America: Its Geographical History, 1492-1892. Six Lectures delivered to Graduate Students of the Johns Hopkins University; with a Supplement entitled, Was the Rio del Espiritu Santo of the Spanish Geographers the Mississippi? By WALTER B. SCAIFE, Ph.D. (Vienna). Baltimore: The Johns Hopkins Press, 1892. Pp. 176. $1.50.

To the information afforded on the title-page it is only necessary to add that this is one of the books included in the series entitled *Johns Hopkins University Studies in Historical and Political Science*, under the general editorship of Professor Herbert B. Adams. The subjects of the several lectures are:—The Development of the Atlantic Coast in the Consciousness of Europe; The Development of Pacific Coast Geography; Geography of the Interior and Polar Regions; Historical Notes on the Geographical Names—America, Brazil, Canada; Development of American National and State Boundaries; Geographical Work of the National Government; and in addition to these the book contains the discussion as to the identity of the Rio del Espiritu Santo of the Spanish geographers, which is printed as a supplement. Each of these lectures embodies a considerable amount of industrious research, in the course of which the evidences contained in old maps have been diligently drawn upon. Dr. Scaife writes with sober and scholarly judgment, and with the advantage of an almost comprehensive knowledge of his subjects. The summaries he gives are encyclopædic in method and spirit, and will be undoubtedly useful to have at hand for reference. It should be said that he breaks a lance, in our opinion successfully, for the often maligned Amerigo Vespucci; and arrives at the conclusion that the Espiritu Santo is to be identified with the river of Alabama or Mobile, whereas he proves that the Mississippi is the stream formerly known as the Panuco. A pocket in the cover contains reproductions of ten old maps, nearly all of the sixteenth century. These alone afford much matter for interesting study.

Adelsberg, seine Grotte und Umgebung. By W. P. VON ALBEN. Adelsberg: R. Schäber, 1892. Pp. 62.

One of the most remarkable features common to nearly all limestone districts that have not suffered heavily from the effects of glacial erosion is the evidence they afford of the solvent action of surface water charged with carbon dioxide. Sinking downward along the joints of the rock, rain water often carries this acid solvent to great depths below the surface, fretting and corroding the sides of the fissures through which it flows. When at length it encounters an impermeable stratum, its flow is arrested until the accumulated water can dissolve for itself an underground channel of communication with some lower part of the rock surface, whence it issues as a spring. In the course of time the walls of the underground channel undergo enlargement, until the water-course is converted into a tunnel or grotto—generally exhibiting great irregularity of form—to which the spring forms the entrance.

After the enlargement of the grotto has passed the largest dimensions which the subterranean stream assumes during the heaviest floods, the corrosion of its

walls and roof gradually lessens, and eventually ceases entirely. When this stage is reached, the formation of stalactites from the roof and of stalagmites on the floor of the grotto commences, and may be continued until the infiltrating calcareous matter has been deposited in its usual striking and fantastic forms to almost any extent short of actually filling up the grotto itself. This, in general terms, may be said to be the history of almost every limestone cave yet known.

Among the more striking natural objects of this kind, the Mammoth Caves of Kentucky may be said to hold the first place. Others hardly less interesting exist in many parts of the world, and amongst them perhaps the first place may be assigned to the wonderful dolinos, grottoes, and underground water-courses of Adelsberg, in Carniola, to which the guide-book here noticed specially refers. Though in most respects the booklet under notice differs but little from guidebooks of the ordinary kind, yet the illustrations, twenty in number, being reproduced in most cases directly from photographic views of the grotto and its surroundings, render it of interest to every student of the natural features of the earth, and especially to the geologist.

The photographs are taken by M. Schäber, Adelsberg. A selection of the best of them will be found in the Society's Library.

The Statesman's Year-Book, 1893. Edited by J. Scott Keltie, Assistant Secretary to the Royal Geographical Society. London: Macmillan and Co. Pp. xxxv. +1152. *Price* 10*s*. 6*d*.

For a work so well-established and of such approved merit as *The Statesman's Year-Book* little is required of the reviewer beyond recording the fact of continued publication. It now appears for the thirtieth year. In the fundamental essential of accuracy, both in fact and in expression, the work leaves little to be desired. By reason of the wealth of information it contains regarding the equipment in war and peace of the various states of the world—information otherwise not readily accessible—the book is invaluable as a work of reference. We have observed some few errors and imperfections in treatment as well as in knowledge of fact. The various constitutional systems are sketched too exclusively in official and fixed phraseology, often obscure, and generally open to improvement: thus, we read—in the language of some of the text-books—"The sole qualification required to be a member of Parliament is to be twenty-one years of age" (p. 9); and the form of words—intelligible enough to the constitutional inquirer—recurs in the book (*e.g.*, p. 468). Again, it is inaccurate—officially, constitutionally, and historically—to write of the "appointment" of "prime ministers," since the latter term is a title merely honorary, incidental, and popular, unknown to official diction and to the law. The list, moreover, should hardly begin before Walpole's long ministry, and its compiler has ignored the resignation of Newcastle in November 1756. More serious is the discrepancy between the table representing the duration of Parliaments, as given in this volume, and the official return to an Address of the Commons of 5th April 1892. We have found this return accurate under the test of occasional reference, and we would now draw the attention of the editor to its existence. The Bill of Rights of 1689 is assigned to the following year (p. 53). The work is rich in statistical information, particularly in respect of industry and commerce. The "introductory tables" are of much value; very useful is the seventh, dealing with the finance and commerce of the British Empire; the sixth, on "the external trade of Africa," is timely—perhaps, too, time-serving. Carefully executed maps are given of the Pamirs and of Central and South Africa according to treaty boundaries.

The Australian Handbook (incorporating New Zealand, Fiji, and New Guinea): Shippers' and Importers' Directory and Business Guide for 1893. London, Melbourne, Sydney, and Brisbane: Gordon and Gotch. Pp. 618.

The twenty-fourth annual issue of the *Australian Handbook* is before us, and shows all those characteristics of clearness, accuracy, and far-reaching scope which have made it the standard work of reference on the political, social, and commercial positions of the various Australasian colonies. It is a model compilation, and deserves a warm welcome not only from those dwelling or having an interest in these colonies, but from the Australian on a visit to the old country, as a considerable amount of space is devoted to the statistics of Great Britain, with much useful information for the stranger in London. The purely geographical portions of the work are full and accurate as ever—the gazetteers of the different divisions being especially well done. The maps are excellent, and most pleasingly tinted. The information specially relating to emigration is of the most useful description, and ought to prove of the greatest service to tradesmen and others desirous of finding a home beyond the seas, while the matter dealing with trade and finance will be found of value to the merchant and capitalist. The whole work is admirably got up, and is adorned with portraits of the Agents-General for each of the larger colonies, besides the numerous maps already referred to. In short, it is needless further to praise a volume already so widely known to geographers and business men as a reliable guide and storehouse of varied and accurate information.

The Year-Book of Science. Edited for 1892 by Prof. T. G. Bonney. London: Cassell and Company, 1893.

The present volume extends to 520 pages, and, as the editor informs us in his preface, while its general plan is the same as that of the volume for 1891, its scope is extended so as to include, amongst other matters, notes on Geography and Anthropology. The list of contributors includes the names of some of the best authorities in the departments upon which they have severally undertaken to report.

With the voluminous mass of literature that is now being published yearly in connection with almost every branch of science, it is almost impossible for any "recorder" to deal adequately with his subject in so small a space as is necessarily allotted to him in the present volume; and it follows, almost of necessity, that while many hundreds of really good papers are passed over without any mention, a few others of hardly any importance at all have found their way into notice along with the better articles referred to in the volume before us. There can be no doubt, however, that the present issue is in this respect much more satisfactory than the last; and if the sale of the book warrants the publishers in extending its pages in future, the difficulties encountered by the editor and his able staff will be much lessened, and the book proportionately increased in value.

The Story of our Continent: A Reader in the Geography and Geology of North America. For the use of Schools. By N. S. Shaler, Professor of Geology in Harvard College. Boston, U.S.A.: Ginn and Co. London: E. Arnold, 1892. Pp. 290. *Price* 3*s.* 6*d.*

In this little book the accomplished author gives an admirable compendium of the physical geography and geology of North America. He traces the gradual growth of the continent from the earliest geological times, and shows how its present state is the result of processes which have gone on in the remote past. The story, it need hardly be said, is told clearly and graphically. Although the book is

designed for school purposes, we can confidently recommend its perusal to all who wish to acquire an intelligent conception of the great continent of which it treats. Especially interesting are the chapters dealing with the natural products and resources of the country, and the effect of the form of the land on the history of the colonists from Europe and their descendants.

Astronomy for Every-day Readers. By B. J. Hopkins. London: George Philip and Son, 1893. Pp. 102. *Price* 1*s.*

This little volume is a useful handbook for those readers who, knowing little scientifically of the ordinary astronomical phenomena constantly occurring around them, desire a popular explanation of their principles. The manual is exactly what it describes itself—as "for everyday readers." Though there is nothing really new in its pages, the story is told in an interesting and simple manner, and can be understood by the least educated. The chapter on tides seems to us to be a particularly happy description of that daily phenomenon, so little understood by the many. The book may be particularly commended to the notice of artisans, as it is written, in his leisure moments, by a working man of whom an interesting biographical note prefaces the volume. The printing is neat and the illustrations good and numerous.

The Cape to Cairo; or, Britain's Sphere of Influence in Africa. By A. L. Bruce, F.R.G.S., F.R.S.E. Edinburgh: Andrew Elliot, 1893. Pp. 48.

The author of this pamphlet has during many years made himself acquainted with, not only the subject-matter with which he deals, but also with the far wider subject of South African politics. We think that he has brought to bear upon the question in hand all that is possible, and that any one reading his pamphlet will agree with his view in regard to British interests in South African matters. A very good map is given with the pamphlet.

Modern Meteorology. By Frank Waldo, Ph.D. London: Walter Scott, Limited, 1893. (The Contemporary Science Series.) Pp. 452, and Index. 112 Illustrations. *Price* 3*s.* 6*d.*

The object of this book is to bring the public into contact with the advances which have been made in the science of meteorology during the past thirty years, and the author has been very successful in his endeavours. He has written a lucid and sufficiently exhaustive account of a branch of science which is gaining in importance every year. A history and description of the most important meteorological instruments are given, and attention is called to the details of equipment and routine in a meteorological observatory. Perhaps the most interesting chapter in the volume is that on applied meteorology, dealing as it does with the oscillations in climate as shown by meteorological observations for long periods, and meteorology applied to agriculture. The volume is enriched by many illustrations, but they are of unequal merit. Figures 19, 20, 23, and one or two others, are too indistinct to be of much use to the general reader.

Dr. Waldo, in Chapter III., has given a very well balanced abstract of the important memoirs of Professor von Bezold on the thermo-dynamics of the atmosphere. Their importance to the study of atmospheric conditions and in the development of atmospheric mechanics can hardly be overestimated, and therefore we welcome this contribution to meteorology, thus made accessible to numbers of practical meteorologists who would in all probability have no other opportunity of learning the Professor's views. We can cordially recommend the book.

Our Earth and its Story. By Dr. Robert Brown. London: Cassell and Co. Part I. With numerous Illustrations and Coloured Plates.

Messrs. Cassell are to be congratulated upon the noteworthy books which they issue from time to time, in parts, at very moderate prices. The one before us now —*Our Earth and its Story*—is not only well written, but well illustrated, and will do much to interest the rising generation and to stimulate them to geographical research. The letterpress is exceedingly good and the illustrations admirable, and we can cordially recommend the publication.

Health Hints for Central Africa. By Horace Waller, M.A. 5th Edition. London: John Murray, 1893. Pp. 57, and Index. *Price* 1*s.*

The Rev. Horace Waller spent several years in Africa with Dr. Livingstone and Sir John Kirk, and in 1873 he published a treatise on African fever, and how to treat and avoid it. In the present edition he had the assistance of Dr. Laws and Dr. Ottley, who have supplied him with a few paragraphs. The little book is written by a layman for laymen, and it cannot be said to treat the subject exhaustively. The hints are useful, and if any one follows the advice given he will probably benefit by the pamphlet. The author recommends coffee very strongly, and he is right in so doing; but it would have been well had he also mentioned that coffee neutralises quinine, and it is probable that the large doses of quinine to which he refers would not be necessary if the patient drank less coffee and tea when taking that drug.

We think it right to mention, too, that the individual susceptibility to quinine is greater than our author seems to imagine. It is not all nonsense that some persons cannot "stand quinine," but perhaps this is a refinement which one should not expect noticed in such a brochure.

Western Australia and its Gold-Fields. By Albert F. Calvert, F.R.G.S., F.R.S.A., F.R.G.S.A., etc. With Government Map. London: George Philip and Son, 1893. Pp. 61. *Price* 1*s.*

Mr. Calvert's work is chiefly devoted to a description of the gold-fields of Western Australia; but he finds space for a historical account of the colony, including its discovery and exploration, its geography and physical features—too meagre in detail, occupying less than a couple of pages—its resources, such as forests, pearl-fisheries, minerals, and agriculture, with notes on land-purchase, railways, and climate; such subjects as education, population, exports, etc., being, strangely enough, included under the last heading. The little book has considerable interest, and we recommend it, although we should have welcomed fuller particulars regarding more than one of the subjects treated of.

Kolonniales Jahrbuch. By Gustav Meinecke. Berlin: Carl Heymanns Verlag, 1892. Pp. 300, and Appendix.

It is rather hard to give a good review of this book, because many of our readers will think that we are prejudiced, but this is not the case. Gustav Meinecke has, we believe, taken good care to write from an unbiassed point of view, and his pages which refer to Emin Pasha and Wissmann are not only full of common sense, but distinguished by candour. His description of South-West Africa and Freiherr von Gravenreuth's expeditions is well detailed. All interested in African politics should read the book, which gives in great detail, not only an account of the events which have happened in Africa, but also reports of the colonial policy of the Reichstag. The great defect in the book is the want of a good index.

NEW MAP.

EUROPE.

FIFE, FORFAR, AND EAST PERTH DISTRICT. Edited by H. R. G. Inglis.
Gall and Inglis: Edinburgh and London. Price 1s.

A map reduced from the Ordnance Survey, and executed in a simple style, without ground colour or contour lines. The railways are rather too faintly indicated, but the roads are very boldly marked in red, and the highest points on them are given in feet. The map is therefore well suited for cyclists and pedestrians.

CHARTS.

CHARTS of the St. Lawrence River. 11 sheets, Nos. 1350-60.
Presented by the U.S Hydrographer, Washington.

ATLASES.

COMMERCIAL AND LIBRARY ATLAS OF THE WORLD. Edited by G. W. Bacon. F.R.G.S. *London: G. W. Bacon and Co.*, 1893.

This Atlas contains 100 diagrams and maps, with numerous inset maps of important cities and ports. There are also 36 pages of letterpress containing a general description of the world, facts of special interest, an etymological glossary of geographical names, a gazetteer of principal towns, and statistics of the world; there is also a copious index.

The quality of the maps is uneven, a considerable number of them being made from old plates, the execution of which is not all that could be desired, and which are often too highly coloured. The errors in the spelling of Scottish place-names, pointed out in October last in connection with another series of maps by the same firm, have not all been corrected. The sectional map of Africa also contains some inaccuracies. Mfumbiro, for instance, is coloured as German; British Central Africa is made to extend as far west as the Kuando; and Tiris, the Spanish Possession on the north-west coast, is prolonged to the Wadi Draa and coloured purple like the Congo State and the Italian Possessions. We also notice that the map of Australia is not up to date.

AN ATLAS OF ASTRONOMY. By Sir Robert S. Ball, LL.D., F.R.S. 72 Plates.
London: George Philip and Son, 1892. *Price* 15*s.*

Originally projected merely as a companion to his *Starland*, Sir Robert Ball's work has developed into one of the best atlases of astronomy yet produced for the use of the student. It is very handy, being but a small and not very thick quarto; it contains seventy-two plates and about sixty pages of introductory explanatory matter. Among the special features of this atlas are charts for recording sun-spot observations, and an admirable series of sixteen Moon charts, prepared by Mr. T. G. Elger, giving a picture of the Moon at nearly every age at which it can be satisfactorily observed. As in other atlases, there are monthly star maps, but Sir Robert has added to this one an "Index to Planets," in which, by an ingenious yet very simple method, the position of the planets for the next ten years can be found in the monthly maps. The book is handsomely produced, and the Moon maps in particular are beautifully printed.

THE SCOTTISH GEOGRAPHICAL MAGAZINE.

REMARKS ON MALARIA AND ACCLIMATISATION.

By H. Martyn Clark, M.D., of Amritsar.

(*Read at a Meeting of the Society in Edinburgh, April* 1892.)

Utterly unknown in the Arctic and but feeble in the temperate zones, malaria acquires its greatest intensity and works the most deadly havoc in the torrid zone and in lands adjacent to the Tropics. As regards geographical distribution, it girdles the globe. It is rife in portions of Southern Europe, and sometimes manifests itself in the central and northern parts of the continent. It still lingers in certain places in our own islands, notably in the Lincolnshire fens and in the Kentish marshes; but it is greatly circumscribed in area, and has lost so much of its virulence that even these parts of the country will doubtless in time be as free from malaria as other districts in which it was once a deadly scourge.

In our own country, as in Europe generally, malaria occurs chiefly in marshy districts, along the courses of rivers, especially of those which overflow their banks; while in northern regions it is confined to moist situations, in the south of Europe it is met with in tracts which are not ordinarily marshy.

So also in America it becomes more general in its distribution and more virulent in its effects as we approach the Tropics, where it attains its fullest intensity, while in the temperate zones it is confined to swampy localities.

In Asia and Africa it is met with under the same conditions. It is the scourge of India, China, Burma, and the Malay Archipelago, and is found also in Australia; in short, it prevails in every land from the Equator to within five or six degrees of the Arctic and Antarctic circles.

According to M. Boudin, the northern limit of malaria is the isothermal line of 5° C. (41° F.). He states that malarial fevers have

been rife at Gelle, in Sweden, 60° 40′ N. latitude, and he has heard of them even further north. The southern limit is still uncertain, and has been variously given at from 25° to 30° S. latitude.

Not only is malaria, within these limits, world-wide in its distribution, but it is the most deadly scourge of mankind. According to the testimony of Sir Joseph Fayrer, Dr. Cornish, Dr. MacCulloch, and other authorities, it is the cause of half the deaths throughout the world, and in India carries off twice as many persons as all other epidemics put together.[1] But the deaths due directly to malaria are no complete measure of its dreadful effects, for many constitutions are ruined by the secondary affections induced by it. It presents, therefore, a formidable barrier to the spread of colonisation and civilisation. What is malaria? is, therefore, a most important question; and, as MacCulloch tersely observes, perhaps the best, as the truest, account of the nature of malaria would be an acknowledgment of utter ignorance on the subject. Despite the many researches made, our knowledge cannot yet be considered adequate, nor can we, as yet, be said definitely to have found the poison of malaria.

The theories that attributed the disease either directly to marshes and their vegetation, or to the production of marsh and other gases, to deficiency of hydrogen or excess of ammonia, are now abandoned. The peculiar symptoms of malaria cannot be explained by any variation in the volume of those gases, and Bourdel has shown by experiments with water collected under varied conditions, and air from marshy places, that the microzoa, microspores, filaments, and bacilli they contain do not cause intermittent fevers. Another theory, that malarial fevers are simply due to chill after exposure to great heat, is met by the facts that many persons subject to chills are not attacked by malaria; that chills are common in countries where malaria has disappeared; that the symptoms of the disease—the peculiar fever, discoloured skin, disorganised blood, and the organic changes in the spleen and liver—do not follow mere chill; and that young children and other persons who do not labour in the hot sun are attacked by fever.

In 1866 Dr. Salisbury of Ohio announced the discovery of a special *alga* (*Palmella gemiasma*) which he assigned as the cause of intermittent fevers in the valleys of the Ohio and Mississippi; and, though his conclusions were not fully accepted, he gave a new impetus to research. Among other micro-organisms set forth as the cause of malaria were Lanzi's germ ferment (*Vacteridium brunneum*), 1866, Eklund's fungus (*Limnophysalis hyalina*), 1878, Klebs and Tommasi-Crudeli's *Bacillus malariæ*, 1879, and Laveran's *Oscillaria malariæ*, now known as *Plasmodium malariæ*, 1881. The observations of Klebs, Tommasi-Crudeli, and others in the Roman Campagna resulted in the discovery of a microscopic fungus about nine micro-millimètres in diameter, which they named *Bacillus malariæ*. It exists in great quantities in the soil, water, and air of malarious localities. With a temperature not under 20° C., humidity, and a supply of oxygen, it develops rapidly, and the spores are found in

[1] Annesley's *Diseases of India*, vol. i. Oldham's *What is Malaria?* p. 2.

the blood, spleen, and marrow of the bones of persons dying from malarious fever. The germs are not found in all marshes, and, on the other hand, exist in soils which have never been marshy. A septic ferment, often present in marshes where the bacillus exists, has been shown by Crudeli not to be a necessary factor in the production of disease. These observations throw light on some of the known facts of malaria—its occurrence at considerable elevations and at places removed from marshes, ponds, etc.

In 1881 Laveran claimed to have discovered in the blood of malarious subjects, in connection with the red corpuscles, rapidly moving filamented spherical organisms of about the same diameter as the corpuscles. Another set of bodies, pigmented like the former and finely granular or transparent, with a diameter of one-hundredth of a micro-millimètre, seemed to be the ultimate forms of the filamented bodies, while a third set were evidently altered blood corpuscles. No doubt the flagellated bodies are living organisms which attach themselves to the red corpuscles and ultimately destroy them. Laveran found this parasite present in 180 out of 192 cases of malaria in North Africa. This view, that malarial fevers are the result of disorganisation of the blood, and the effect of this disorganisation on the nerve centres, would explain many of the symptoms, such as liver and spleen lesions and that grave *Dyscrasia melanamia* in which free masses of pigment are found in the blood. But of the life-history of these animalculæ, and of the mode by which they gain access to the blood, nothing is known at present, and Laveran's theory cannot yet be finally accepted ; Lewis has described very similar organisms found in the blood of healthy animals. Many investigators, however, who have followed in Laveran's track, have corroborated his testimony, and hence there is a growing consensus of opinion that malaria is due to the introduction of *Plasmodium malariæ* into the system ; that it attacks the red blood corpuscles, lives and grows within them, and finally disintegrates them. It is impossible to over-estimate the importance of these observations ; we seem now to be really grasping the truth concerning the cause of malaria.

At present, the sum of our knowledge seems to be this : that malaria is an earth-born poison ; that it appears to proceed from those elements which exist in soil and nourish animal and vegetable life, if the said elements be allowed to lie fallow and are not fully expended in the growth of healthy vegetation : that under such circumstances malaria is produced if the conditions of temperature, moisture, and air be favourable. Though the precise nature of the poison is still undetermined, the conditions under which malaria is evolved, and certain other practical facts concerning it, are well known.

As a general rule (for altitude may have a modifying effect), marshy places, low lands, and lands subject to inundation are the chosen haunts of malaria. Deep, rich, absorbent soils, argillaceous or alluvial, are in my experience another favourite abode of the poison, which also flourishes in bottoms, valleys, and confined places, such as a plain hemmed in by hills or sheltered from the prevailing winds, so that stillness and stagnation are produced. Such places are usually rich in organic remains ; and

malaria will flourish the better where there is a luxuriant vegetation, for, in a tropical land, this indicates abundance of moisture.

In India (the land best known to me) rivers and streams, almost from their sources to their mouths, are some of the chief haunts of malaria, and prime factors in its production. Having but a slight fall, they wind sluggishly through the vast plains, and, though confined in the summer to a single channel of no great width and depth, inundate vast tracts of country during the rains, allowing their waters to permeate the soil for considerable distances. For example, the Indus, which is but a quarter of a mile wide in the hot season, becomes 18 miles wide at Dera Ghazi Khan, and takes 12 hours, and not infrequently from 18 to 24 hours, to cross. In its last great flood, in 1889, in one portion of its course, this river inundated close upon 700 square miles of country. As it receded, vast lagoons were left, and as they slowly evaporated, during a period of five months, malarial disease became very rife. The unhealthy time is not during the rains, but when the inundated lands begin to dry.

The permeation of adjoining lands by the waters of a river, apart from inundations, has not received notice. This is a great factor in rendering tracts of land through which a river flows unhealthy. The distance from the banks to which water permeates will depend on the nature of the soil. I have seen wells affected at a distance of a mile and a half from the river. Again, at the mouths of the rivers, low and large islands are formed by alluvium, which are as unhealthy as marshes, and bars are thrown up, over which the waves dash during storms and high tides, converting large tracts of country into salt-water lagoons, which are also fertile sources of malaria. If, in addition, we think of the amount of organic matter an Indian river holds in solution, of the filth that drains into it, and of the carcasses consigned to it, we shall see that, independently of its malaria-producing power, it is a serious danger to public health, for it often constitutes alike the sewer and the water supply of the districts through which it passes.

The second great malaria-producer in India is the jungle, which clothes the valleys, the plains, and the sides of low hills. There is a great difference between a forest and a jungle; the former consists of lofty trees, while the latter is clothed with grass, small shrubs, and succulent plants, forming a dense undergrowth. The soil is rich, but not under cultivation; and we have a dense mass of vegetation, a moist, stagnant atmosphere, and a soil which, after heavy rain, is soaked with water—for the roots of the plants hold the rain-water, and part with it slowly, so that a hill-side becomes for the time almost a morass, which as it dries becomes a source of malaria. In addition to rain, heavy dews keep up the process, of which those who have not been in India can have no conception. They soak the ground as rain would do, and make a tent so wet that it is impossible to strike it until the sun has dried the canvas.

The water-retaining power of plants is very great; thus moss (*Hypnum*) under conifers absorbs up to five times its own weight of water, *Sphagnum* (peat moss) up to seven times its weight, and leaf-mould in a middle-aged beech forest can actually absorb and retain no less than five inches of rainfall. In a jungle, not only is malaria produced,

but there is no check to its dissemination, as the winds blow it in all directions. One of the most deadly regions in the world is the Terai, a strip of country lying at the foot of the Himalaya, about eighty miles in breadth and several hundred miles in length. It is covered with dense jungle, the soil is rich, with abundance of both surface and subsoil water, and the temperature is high. The result is malaria-production of the most intense kind, so that the district has been uninhabited for many years. Government has made many efforts to reclaim it, but as yet with very doubtful success. Roads have been made, canals cut, railways projected, and villages planted; the fight with malaria has been steadily carried on with a fearful sacrifice of human life. The teeming population from the south persistently sends out fresh emigrants, who bring their ploughs and cattle and household gods, and build themselves houses, sometimes to succeed, sometimes to fly back panic-stricken after an unhealthy season, leaving half their number under the sod.

What happens on a large scale in the Terai happens all over India on a smaller scale, as the result of malaria-production in jungles.

The influence of a forest is somewhat different. If we take as an example what foresters term a "high forest" (that is, one in which the trees have sprung from seedlings, and are destined to grow to a large size), we find that at the earlier and middle period of its life the crowns of the trees form a dense canopy overhead; the ground is covered with *humus*, that is, leaf-mould undergoing decomposition, and is shaded by the trees alike from the direct and oblique rays of the sun, and, moreover, the crowns intercept directly no less than one-quarter of the total rainfall, keep the air from the soil, and break up the currents.

Such forests have a marked effect on the surrounding country. Being cooler by day and warmer by night than open country, they render the climate of the neighbouring districts more equable, and they have a similar effect in moderating the extreme temperatures of summer and winter—great advantages in an Eastern land. As regards malaria, the formation of miasma is hindered by the shade, and the poison that is developed, being intercepted by the trees, cannot spread freely over the country. Later on, however, circumstances change; the trees thin out in course of time, the canopy overhead is interrupted, the crowns of the trees that are left, instead of being dense and compact, spread out on all sides. Mosses begin to disappear, and grass takes their place. Sun and air now begin to play on the *humus* and soil, which receive almost all the rainfall; the conditions now begin to approximate more to those of the ordinary jungle, and the forest may then become as dire a focus of infection as any jungle can be. I have often noticed that people living in dense forests seemed to enjoy immunity from malarial fevers as compared with those dwelling in tracts where the forest had become like a sparsely timbered park. I have been writing of ordinary forests; but there are certain wet, close woods which are very pernicious in their effects, the cause of the trouble probably being, not the wood, but the wetness; the soil is usually a rich, absorbent loam, the vegetation is rank, and as there is no drainage, the factors of malaria-production are present in abundance; such a place would be deadly even if there were no wood.

Alike in forest, jungle, and ordinary land there is one factor present in the East which, though it may have no share in the actual production of malaria, yet tends to vitiate the air, lower vitality, and predispose to disease—I refer to the superabundant animal life, more especially insect life. To say that insects swarm is a feeble expression. I have seen clouds of mosquitos so dense as really to resemble a heaving solid mass in the air, much like a very large number of fish struggling in an utterly inadequate supply of water. After the first rain, the queen of a species of ant or termite which I have not been able to define issues from the ground. She is about half an inch long, and has two wings like those of the crane fly or "daddy-long-legs" (*Tipula oleracea*). After her hymeneal flight she drops the wings, and retires into the earth to fulfil her function as the mother of future colonies. To give some conception of the numbers of these insects, I may mention that one morning after a rainy day in July the gossamer-like wings swept together in one room only of my house formed a heap two feet in height and about two and a half in circumference, though myriads of the queens must have been eaten the evening before by birds, which were busy devouring them on all sides. This relates to one species of insect only, but there are hundreds of others equally numerous, such as ants, beetles, butterflies, gnats, hornets, flies, wasps, and also swarms of land frogs and other reptiles. This vast quantity of animal matter decaying in jungle and marsh, forest and open land, though it may have no share in the actual evolution of malaria, affects the general health, and thus paves the way for the ravages of disease.

It is an axiom with us in the East that any low-lying land, with a quickly growing, luxuriant vegetation and a superabundance of insect life, is almost certain to be pestilential. Clearance of soil, cultivation and cutting down of forests do not necessarily remove the evils which produce malaria. It has, indeed, often happened that the outbreaks of disease have been greatly intensified by such clearances. Malarial soil covered by leaf-mould, protected from air and sunlight, and to some extent from moisture, by trees, which also intercept malarial exhalations, is manifestly less dangerous to a community than the same soil denuded of its trees and exposed to rain, sun, and air. It is far more dangerous to have such a soil covered with grass and jungle. When the protecting trees have been removed, the soil, saturated with animal remains and accumulations of vegetable matter, is placed under the most favourable conditions for the development of malaria; and the result is that localities once fairly healthy become fever-stricken, while those which were affected by milder forms of fever become pestilential. The danger of turning up the soil and exposing it to sun and showers has often been exemplified. There was a great outbreak of malarial disease in Paris when the Canal St. Martin was excavated. A most fatal fever devastated Hong Kong when the hill behind the city (Victoria) was broken up for building purposes. Labuan was ravaged by malaria when the harbour works were constructed, and, in my own experience, the laying out of some eighty miles of new railway, which entailed a good deal of earth-work, was accompanied by severe malarial fevers. Drainage, clearances, cultivation will eventually win the day against malaria; but, to avoid risk of

infection and loss of life, it is necessary to proceed with caution. The ground should never be laid bare, but should be sown while the trees are still standing; and as regards buildings, excavations, and all operations which entail the breaking-up of soil, it is most important that they should be carried on when the chances of rain are least—and, inasmuch as the seasons are very regular in tropical lands, a fit time may easily be chosen.

We have hitherto considered malaria as it is produced in jungles and low-lying lands, in rich, fertile soils; but it is as prevalent and fatal on the high, sandy ground of the Deccan, in the breezy upland plains of the Punjab, in desert Scinde, in Bhawulpore, in the Peshawur valley, in many a place without either marsh or jungle, and, in fact, in some which are entirely devoid of vegetation. We owe it to Dr. Crudeli's researches that the idea of *marshes* being the sole origin of malaria has been dismissed from our minds, and that another clew has been placed in our hands. While the old belief in marsh poison dominated, it was impossible to explain rationally the outbreaks of fever in the arid lands of the Punjab and Northern India, in the dry soil of Estremadura, where the British army was decimated by malaria during the Peninsular War, and in other similar instances. We now know that a very slight degree of moisture suffices for the production of malaria, and it is to be remembered that many arid lands are full of enormous vegetative energy. Many hundred miles of land in India, now smiling with rich harvests, were arid wastes before the British irrigation canals were made; and were irrigation to be discontinued, in a few months that fruitful land would turn to barren desert again.

The slight amount of moisture needed may be supplied by dew or rain, but it is generally, I believe, derived from the subsoil. Subsoil water is a potent factor in malaria-production. Its continual rise and fall, which, so far as I know, has never been noted, must have a very great effect. An example will illustrate my meaning. In Amritsar, in the Central Punjab, the subsoil water stands at 10 feet below ground. Irrigation is effected partly by wells. After six hours watering from a well, I noticed that the water-level had fallen 4 feet, so that the subsoil water-level immediately around the well was then 14 feet instead of 10. In six hours the well again rose to its old level. During these hours there was below ground a depth of soil of 4 feet which was practically drying, and thus round all the wells of the district extended many square miles of malaria-producing land. Recent researches of French and German foresters show that the soil is continually absorbing and exhaling air. The depth to which air penetrates depends on the nature of the soil, and has not yet been accurately ascertained. In my opinion, the pressure of the atmosphere on the soil must of necessity drive air into it, and in a porous soil will, in all probability, force it down to the subsoil water-level. We thus have a moist soil acted on by air. Air has also abundant access to the lower strata in a hot country through the cracks and rifts which abound in the soil. Some of the malaria thus produced is doubtless exhaled, as air is driven out by the rising subsoil water, or by the ascent of heated air-currents; but some of it remains and is washed into the wells. This source of infection is most important.

for malaria is doubtless imbibed as well as inhaled. Subsoil water is affected also by summer heat and rainfall, both factors in the production of malaria. It is impossible to over-estimate the important part it plays in the generation of malarial poison. It may be taken as a rigid and unfailing rule that, in proportion as the subsoil water is nearer to the surface, so the unhealthiness of a place is increased. Perhaps the most remarkable instance is that furnished by the city of Allahabad in India. This city is built upon the tongue of land between the rivers Ganges and Jumna. The old barracks stood 50 feet above the river, where the subsoil water was 40 feet below the surface. Some years ago new barracks were, for strategic reasons, built near the railway station. They are roomier, loftier, and immensely better than the old ones, with every modern improvement, and the soldiers sleep on the second story, instead of on the ground floor as in the old barracks; but the subsoil water under them is but 12 feet from the surface, and here the soldiers suffer very much more from malarial diseases than they did before. Amritsar was at one time looked on as a health resort. In 1859 the subsoil water was 40 feet below the surface, but irrigation canals have since been made, the land has been systematically flooded, there is no subsoil drainage, the water-level now (1892) stands at from 8 to 10 feet below the surface, and the place has become one of the most unhealthy in the whole Punjab.

Deadly malaria may be present where the surface is composed solely of rock and there is no subsoil water. The most famous case on record is the hill behind Victoria in Hong Kong. The rock is pure granite, but Dr. Maclean notes that it is disintegrated and loaded with fungi, while another observer, Dr. Black, states that it is "so porous that it is something like a mineral bog." In the absence of rain and subsoil water, moisture must, I should think, be supplied by heavy dew. But in all instances of malarial diseases occurring in places where they cannot, apparently, be locally produced, we must not forget the possibility of infection from a distance. Malaria appears to be heavier than air, and, given winds powerful enough to propel it but not strong enough to dispel it, there is no valid reason why it should not be carried very considerable distances. In all abnormal cases regard should be had to prevailing winds as the probable explanation of the problem. Thus, places with surroundings apparently unhealthy are sometimes found to be healthy, for the prevailing winds blow the malaria away from them; and the converse also holds good.

A striking instance of this is presented by the Kangra valley in the Punjab. At certain periods of the year it is a vast rice swamp, which may be safely traversed as long as it is flooded, but as soon as the grain has been cut and the ground begins to dry, the most terrible outbreaks of malarial fever occur. The snowy range of the Himalaya rises up from this valley to a height of 17,000 feet. At the bottom of the mountain, mangoes ripen and the climate is almost tropical, while at the top we have eternal snow, and all gradations of climate between. Now, on the outbreak of fever in the valley, malaria makes its appearance on the hill-side up to an elevation of 6000 or 7000 feet; and it should be noted

that it is not the houses and villages situated on bluffs and knolls which suffer, but those built along the water-courses and gullies that score the sides of the mountain, and up which the malarial poison is blown. Between the high banks of the water-courses there are two currents, a descending one of water and an ascending one of malaria. Above 7000 feet there are no villages, so I cannot say whether the poison goes further; but it appears to decrease steadily in intensity with every 1000 feet of ascent, and the valleys beyond the snowy pass get no malaria at all.

In selecting sanitaria in the hills, or in building houses, regard should always be had to rifts, gullies, and water-courses, and to the not improbable danger of infection from lands below. The density of malaria is also noteworthy in another way. In comparatively flat countries, bordered by hills, any little valley or hollow is a most dangerous place between sunset and a short time after sunrise. As the hot air radiates from the ground, cold air rushes down to supply its place. It trickles down the hill-sides into the hollows, so that the latter become practically lakes of cold air. Colonel Bailey told me a striking instance in his own experience. He once, when in India, pitched his tent at the foot of a bank, about 15 feet below the general surface of the surrounding country, in order to obtain shelter from the wind, and suffered from intense cold throughout the night. The night following he pitched on the top of the bank, and, in spite of the wind, was comparatively warm and comfortable. That in these cold air basins malaria also collects I once had practical proof myself.

One early morning in March, I had to descend a little hill, cross a small valley about 100 yards wide, and ascend another hill on the opposite side. As I went downhill the sun was warm, but the valley still lay in the shade. As I descended into it the intense chilliness struck sharply through me. I crossed rapidly, but before I had mounted 300 yards up the opposite slope, I was in the miseries of the cold stage of an intermittent fever which hung about me for a week. Half-an-hour later the valley was flooded with bright sunshine, and it could then have been traversed with safety. This fact concerning the weight of malaria has its practical application in the measures to be taken for escaping it. A very simple but effective precaution is to sleep above the ground. The peasants of the Roman Campagna sleep in old Etruscan tombs, perched up above the plain; the American Indians sleep in trees; the workmen of the Panama Canal slung their hammocks at night in the highest trees, with the best results; the people of malarious tracts in Greece and in the Pontine Marshes sleep on raised platforms. Sleeping on an upper story instead of on the ground floor confers marked immunity. Hunter records that cases of malarial fevers in Kingston Barracks, Jamaica, occurred in the proportion of three on the ground floor to one on the upper; and other instances might be given.

The production of malaria proceeds as freely during the earlier part of the night as during any part of the day; with this difference, that when malaria is evolved during the day, it is presumably not concentrated but dissipated and carried into the higher regions by the heated air currents. It is otherwise at night. After sundown the heated earth takes longer to cool than the air; in fact, the earth can hardly be said to

become cool except in the early morning. Consequently, the malaria then accumulates on the surface of the ground and becomes highly dangerous. In the East the night is always considered to be the most dangerous time. As soon as the sun sets a peculiar chilliness is at once evident at most seasons, and the danger is enhanced if the air be still and humid. For another reason also the weight of malaria and its method of propulsion by air currents is important. It can, I believe, be deflected from its course by walls or houses; thus, an intervening building may protect another, and the infected air may be intercepted by walls round towns, by the suburbs of a city, or by other obstructions of a like nature. This view has an important bearing on sanitary measures in India. An Indian town appears to be built in defiance of all sanitary laws. A high wall surrounds it. The streets are extremely narrow and crooked; the roofs of houses on opposite sides of the pathway almost touch one another; and the *tout ensemble* violates our theories of ventilation and of other sanitary requirements. Of late years there has been a perfect mania for widening and improving streets, for introducing costly schemes of drainage and water-supply, and for approximating Indian towns to the Western ideal. My observations lead me to think the result unsatisfactory, unless such measures be well considered and the improvements be very carefully executed. In the East everything Eastern is not of necessity bad, nor is a thing which is good in the West always suitable to the East. I believe that thousands of years of experience have, in many instances, taught the people of India what is best for them in matters relating to food, clothing, houses, exposure, sleep, and the details of daily life; and rashly to disregard the practical outcome of generations of experience and to supplant old habits by others, acquired under totally different conditions of life—natural, social, and climatic—is not for the benefit of the people. We should help them to rectify obvious mistakes, and supply that which seems lacking; else, as an old Indian gentleman tersely expressed it, "you will, with the bath-water, also throw away the child." Now, straight and wide streets and free air-currents are doubtless good, if we can only stop the evolution of malaria round about a city; otherwise, by removing protecting walls and deflecting angles, we do but lay the city more open to the enemy. The narrow streets excluded the sun, which in the broad, improved street beats fiercely on the ground, scorching pitilessly, and causing the most horrible emanations from the open drains and sewers, which are never flushed, and have but little fall. Drainage, again, is comparatively easy in our sea-girt island, with its slopes and valleys and abundant water-supply. It is not so simple a matter in the flat Punjab plains, with hardly any fall, with a limited water-supply, a burning sun, combined with a limited intelligence, and an intense conservatism in these matters—the outcome of a set of social customs, traditions, and beliefs utterly different from our own. Then again, a rich country like ours can afford to buy its food abroad, and to lose millions of pounds sterling annually by letting its drainage and waste run into the sea; but India is a poor country, and the problem is how best to return to the soil what has been taken out of it, in order that its fertility may not be impaired.

A portion of the great city of Amritsar, in the Punjab, has been rebuilt. The new streets are stately and wide, and there is now light and air in the spacious houses, in accordance with Western ideas. Yet the worst cases of malarial fevers, in my experience, have been in this part of the town; and, proportionately, sickness is quite as rife here as in the older part. I do not undervalue the blessings of modern sanitation. Sanitary science has a great future in India; but it must move cautiously. Wide streets will do good when malaria-production ceases.

The effects of screening from malaria by means of walls were exemplified in a great outbreak in Jubbulpore, in Central India, in 1866. Within 500 yards of a swamp stood the Royal Artillery barracks, and between them and the swamp the barracks of the 23rd Regiment (Welsh Fusiliers), which ran in the same direction, and occupied the same extent of front, so that the Artillery were completely screened from the swamp. A most fatal fever broke out amongst the Welsh Fusiliers. 300 men being attacked out of a total strength of 500; but there was not a single case of fever in the adjacent Artillery lines. The Artillerymen were put on daily doses of quinine as a prophylactic, and this doubtless contributed to the result recorded; but as the drug was not issued until after the malarial outbreak had established itself in the 23rd Regiment, the exemption of the Artillery from attack was not, in the first instance, due to it. No doubt the Infantry barracks screened the Artillery from the malaria, or it is reasonable to suppose that the causes which produced the fever amongst the Fusiliers would have had the same effect on the men in the adjoining buildings.

Mian-Mir, one of the largest military cantonments in the Punjab, furnishes another example. Though carefully planned and constructed, it is one of the most unhealthy of all the northern Indian stations; whereas Lahore, four miles distant, on the marshy banks of the Ravi river, a typical Indian town, with a crowded native population in its narrow streets, suffers far less from malaria. Difference of race will not account for these facts, for I have found that the poorly fed and clothed Hindu is more subject to malaria than the European; and, moreover, the British soldier is a picked man, in the full flush of his manhood. We must, it seems to me, conclude that the wider streets give freer access to malaria.

Another curious fact concerning malaria which has come under my notice is that it sometimes concentrates itself for weeks, and even months, in a particular locality. A remarkable instance occurred at Amritsar in 1881, when there was a malarial pestilence such as is seldom experienced even in India. The city stands 1500 feet above sea-level, and is distant about the same number of miles from the sea, so that the fall is approximately a foot to the mile. It is built in a sort of shallow dip or basin about three miles in circumference, forming a part of the great plain extending for about 2000 miles from Peshawur to Calcutta. On either side run the rivers Ravi and Bias, and close by are two very large irrigation canals, from which many million tons of water are annually turned on to the soil; there is no subsoil drainage, and the subsoil water has risen from 40 feet below the surface in 1859 to 10 feet in 1891, and is

still rising. Places that were gardens when I first went there are now marshes. The soil is a deep, rich clay, producing a most luxuriant vegetation, and numbers of large gardens are regularly flooded twice a week with canal water, impregnated with decaying vegetable matter and the remains of numberless reptiles and insects. The city (the largest in the Punjab) is girdled by morasses and marshes. There are many stagnant pools in all directions, consisting of a central mass of putrefying water, thick with green scum, and surrounded by circles of half-dried mud, the outermost having broken and curled up as it dried. The bodies of dead animals not infrequently add to the terrible smell that comes from these pools. Then, as it is a holy city, there are numbers of great tanks built by the pious for the performance of religious duties, which reproduce the conditions of the stagnant pools, and, in addition, receive an enormous amount of organic pollution from the bathing and washing continually carried on in them. The sanitary arrangements are not of the best; the water supply comes from wells, and there is a teeming population, subject at certain periods to great additions by the influx of merchants from all parts of Northern India and Central Asia into this great commercial capital, and also of pilgrims, who come at certain times in vast numbers to the holy city. The conditions are thus pre-eminently favourable to malaria, which is never absent; but in 1881 it developed into a pestilence. In June of that year an abnormal rainfall occurred. The average for fifteen years had been 24·9 inches; but in 1881 it rose to 52·2 in the city, and to 68·5 in the district. Immense lakes were formed in all directions, and the subsoil water rose flush with the ground. As long as the land was flooded all went well; but as the waters began to dry up, malarial diseases appeared in a well-marked sequence—intermittents at first, and remittents when the drying process was more advanced; and in September, when the whole land was bare, malarial fever of a most malignant type broke out and raged through many weeks. The fever was characterised by very severe rigors, high temperature, coma, and death in a few hours after seizure. Nine-tenths of the shops were closed; railway, post, and telegraph offices were worked under the greatest difficulties; grass grew in the streets; and the place looked like a city of the dead. The mortality in two months was about 12,000. From the 19th to the 30th of September 2265 persons are reported to have died; but these figures are much below the reality, because of the reluctance of the natives to give information concerning deaths. At one time the death-rate was calculated to be 600 in the 1000, instead of forty or fifty as it usually is. Two hundred corpses were carried out every day, and thousands of people fled into the country and died there. Many thousands more died in the months after the epidemic had ceased, from secondary disorders; and not a single European escaped attack.

A curious circumstance was that during this terrible visitation a bright grey haze hung over the city, and that there was a distinct, sharply drawn, malarial line. As one entered the city, one felt a marked difference in the air; and healthy European adults, who had just come down from the hills, were seized with vomiting and pains in the limbs as they crossed the malarial line, and had to be taken home. Places

outside the city suffered less, and those in the district some miles away had no unusual amount of malarial disease for the time of year.

During a violent outbreak of malarial fever in the Gujerat district in 1890, when, according to the official returns, only one person in 1000 escaped attack, the pestilence was confined to the one district. A very remarkable instance of the localisation of malaria is recorded by Dr. Divorty. He took a new house in Carlisle built over ground that had recently been much disturbed, and was seized with fever on the first night he slept in it. The singular circumstance was that he could always stop a paroxysm, when he felt it coming on, by going a few yards away from the house.

The malarial poison is usually breathed into the system, but it is, in my opinion, quite as commonly imbibed. Water is contaminated in two ways: either by the power that it has of absorbing malaria which passes over its surface, or, in the case of wells, through the subsoil water, as I have noticed elsewhere; and the reason why some Indian cities have not benefited from new water-supplies is that the water comes from an infected source. This is also one of the causes of malarial outbreaks on board ship in mid-ocean. Streams flowing through the Terai are often very dangerous because of the malaria in them. In 1884 a party of workmen sent to repair a bridge over the Chuka drank of this stream, and out of thirty only three escaped fever, while several of them died. A deep well has now been sunk near the river, and the station has become as healthy as any other. The Forest Department have now sunk a large number of wells, with the result that instead of having to invalid their employés once every fortnight, they are enabled to retain a permanent staff. The streams known to be deadly all rise in dense forest, and are overhung by shrubs and bushes; those bordered by sand or shingle seem to be much less infected.

Milk may probably be another source of infection, apart from the water which may have been added to it. It is a moot point in India whether the great prevalence of enteric fever may not be due to the fact that cows are fed on garbage of all kinds. They become infected with the germ, and there is, consequently, infection of the milk. The same reasoning would apply in the case of malaria. The buffalo, whose milk is largely used, is an animal that delights to wallow in the mud of marshes, and during the hot weather it spends both days and nights immersed in the nearest marsh, swamp, or pond, with only the nostrils protruding. Both it and the cow are watered at the filthy pools I have described. Malaria must enter plentifully into these animals. They are said to have attacks of fever, but of this I cannot speak from personal knowledge. I have only seen one dog which undoubtedly suffered from tertian ague. If the milk can be infected by the systematic infection of the animal, it may be a vehicle of malarial transmission—as it is of tubercle.

The mosquito has, I am convinced, a large share in the propagation of disease in the East. Those who have not suffered from them can have no conception of the myriads of these insects, nor of the intense torments they cause. Their poison is said to be, weight for weight, more

virulent than that of the cobra. They predispose to malarial fevers by the intense irritation, the restlessness, insomnia, nervous exhaustion, and prostration which sometimes result from the injuries they inflict. It may also be that, as some insects carry the pollen of one plant to the flower of another, so mosquitos transplant the malarial germ to a suitable *nidus* by directly inoculating their victims with it. The eggs of this insect are laid in water, and the larvæ are hatched in the mud of swamps, pools, wells, and other stagnant waters. They must, therefore, be saturated with the germs of malaria, and it will probably some day be ascertained that the mosquito fulfils a part in their transmission. This insect has a well-ascertained share in the development of the *Filaria sanguinis hominis*. The question was first investigated by Dr. Manson of Amoy, and thereafter by Cunningham and Lewis, who found that no less than 14 per cent. of the insects caught at random contained filarious embryos. If the germ of malaria prove to be a *hæmatozoon*, mosquitos and other such insects will be found to have a share in inoculating their victims (1) from the original source of the poison, (2) from person to person, (3) by the contamination of articles of food and of water in which they breed and die.

Though malarial diseases are present all the year round, yet the seasons have a marked influence on their intensity. With us, in India, the two most unhealthy months of the year as regards malaria are September and January, in both of which the land is drying, or has just dried, after heavy rain.

One attack of malarial fever seems to predispose to another; and when once it gets into the system I believe the poison is never eradicated. It lies dormant, but is readily roused into activity by any passing cause; so that a specific malarial manifestation may be the result of poison acquired years ago. Thus, we frequently have cases of people who while abroad have enjoyed perfect health, yet when they come home the change of climate so disturbs the balance of their system that they suffer from severe attacks of malarial fever. They absorbed the poison abroad, but their state of health was then good, and not favourable to disease; but as soon as circumstances changed, the virus asserted itself. Similarly, when the balance of health is disturbed by some passing affection, malarial poisoning supervenes, aggravating or complicating the complaint, or following after it and proving sometimes more formidable than the original disease.

The first year at home is, I am inclined to think, a critical period for those who have been long abroad, just as the first year abroad is a trying one for us when we first go out. In nine years of Indian life I have suffered from malarial fever about eight times. In the one year of furlough at home I have had about thirty attacks—much milder than they would have been in India, but distinct attacks nevertheless. Three friends who came home about the same time have not been so fortunate; some of the severest attacks they have ever had have occurred during their first year of furlough. In addition to the change of climate, there is a change in the habit of life; and probably the lack of mental stimulus that daily official work affords, as well as the great increase in purely

physical exertion, are as potent factors in favouring malarial outbreaks as changes of climatic conditions.

The various malarial diseases in all lands are the outcome of one identical poison, and the effects produced depend on the quantity of the poison which enters the system, its degree of concentration, the seasonal temperature and humidity, and last, but not least, on the individual constitution. That the poison is identical in all lands and in all varieties of malarial diseases, is evident from the broad lines of resemblance which malarial manifestations bear to each other in all quarters of the globe—the periodicity, the specific course of the symptoms, the specific lesions produced by the poison of malaria in the liver, spleen, and blood, and the value of the specific treatment by quinine. These features, however much they are modified by country, climate, or season, yet remain essentially the same. Idiosyncrasy or individual peculiarity in those affected must also be taken into account, for it is difficult otherwise to see why the same poison should in one case produce fever—quotidian, tertian, or quartan—and in another neuralgia, hemicrania, or dysentery. Another proof that the poison, however varied its outward manifestations, is one and the same is to be found in the way in which malarial diseases merge into one another. Thus, when a malarial outbreak occurs, we have, in proportion as the land dries, intermittents, then remittents, and, finally, the most acute form of fever. It is stated that at the commencement of the intermittents the tertian is the common type of fever; as the character of the epidemic grows more severe, quotidians obtain; and as it begins to die away, the fever reverts again to the tertian or quartan type. Remittent fever often passes into intermittent as the patient tends towards recovery; and similarly an intermittent may pass into a remittent fever, and this in turn into the acute form met with in certain epidemics, in which the intensity of the poison very rapidly destroys life.

Though fevers are the chief manifestations of malarial poison, they are not the only diseases produced by it. It has a direct causal relation to dysentery and abscess of the liver; and in addition to these it frequently gives rise to the most varied diseases of other kinds.

The number of diseases of which malaria is the parent is infinite. Even when there is no actual disease present, the poison is inimical to life, especially the life of Europeans. The fevers and other diseases to which it directly gives rise are bad enough; but the true scourge is the chronic malarial infection of the system that goes on day by day. It is this that saps the strength and destroys the life of the individual, and ultimately causes deterioration of the race. It resists remedies in a remarkable degree; and even when the victim has been removed to better surroundings, or has returned to his own land, it causes permanent ill-health and suffering. The infection is progressive, and hence renders acclimatisation to malaria impossible. Certain races undoubtedly enjoy greater immunity from malaria than others: thus the Negro is said to be less susceptible than any other race of mankind, especially the Negroes of the Grain Coast of Guinea. Their country is but a few feet above sea-level, is constantly inundated, and abounds in lagoons, marshes, and rice-swamps. The climate is most deadly to

Europeans, and is unfavourable even to domestic animals. Yet in this unpromising land the Negro flourishes in great perfection. The inhabitants are well grown, very little subject to disease, and, as a rule, live to a good old age. In the rice-growing countries of America also, while the white population suffers from malaria, the black is exempt; and in India, according to Sir J. Fayrer, the Tárus, who inhabit the Terai, appear to enjoy comparative immunity from malaria. Individuals doubtless vary in their susceptibility to malarial influence, and in past ages malaria may have been the great acclimatiser, sweeping away all who could not withstand its ravages. This process of elimination may possibly have gone on in the past, though nowadays there are no traces of its action amongst any of the Indian peoples, nor, as far as I know, amongst any race elsewhere. Amongst civilised peoples not only is the selection of individuals and species impossible, but, in addition, medical science strives to keep alive the weaklings of the race by appropriate measures. The white races can never acquire immunity from the attacks of malaria. Annesley records that in Georgia (U.S.A.) white women seldom attain the age of forty, and white men seldom that of fifty, unless they have arrived at adult age before they settle.

In India, where there is ample opportunity for observation, it is evident that with each successive year the European race becomes more and more unfit to bear the climate. There is no such thing, I believe, in existence as a third, or even a second, generation of Europeans in India born and brought up in the plains. Even when brought up in the hills the stock tends to die out in the third generation. European children in West Africa seldom reach the age of ten years. In India, even with the climate of the hills in summer and that of the plains in winter (the two best climates in the world), the life of the European child is beset with many perils. If we consider the high position of life occupied by most of the parents, and the care and provision for children that are possible, infant mortality in India is proportionately extremely large. The children, despite every care, do not thrive after a certain age; they are stunted in growth, and (besides deficient mental and moral development) have little or no strength of constitution. There is a peculiar form of *cachexia*—due to malaria—in children, which is sometimes noticed in mere infants. They become wasted, are always ailing, and do not thrive; physically, a blight seems to rest upon them, while in mind they are rather precocious. Unless they obtain a change of climate such children soon die off; and even after they reach home they require careful attention and treatment before they begin to thrive. Malarial *cachexia* may exist with or without fever.

The effects of Indian climate are equally evident in the youth who is unfortunate enough to go there before his constitution has been fully developed. He suffers greatly from malaria, and either succumbs to it or has to be invalided home, shattered in health. In a case under my own observation, a youth aged seventeen who went from Scotland to India nearly lost his life from malarial fever twice in the first year, and suffered much from long-continued and severe intermittent fever, so that he had to return home. He went out again to the same place, and to a

harder life, when he was twenty-two, with his constitution fully developed, and has hardly suffered at all from malaria. While such are the deadly effects of the malarial poison on young and unformed constitutions, those who go out after they have attained maturity have their constitutions steadily undermined by chronic malarial infection, so that with each year life in India becomes harder. Their bodily fibres lose tone, they become much more susceptible to heat and cold, and less able to withstand the inroads of disease. Acclimatisation is not possible in the plains of India, and even in the hills and in districts beyond the limits of malaria the tendency of the stock is to degenerate and to die out, or else to approximate to the aboriginal. For maintenance of health and stamina frequent visits home are necessary; after the first five or seven years of foreign residence, and at the conclusion of every subsequent five years, are the times when a European in good health should take furlough if he is to maintain his constitution unimpaired; but these terms must be subject to great variation, according to the special circumstances of each case. Prolonged residence beyond seven years is possible, but is not advisable. There must be a longer period of rest and change in such cases to restore the balance of the constitution, and prolonged residence has often reduced the vital and recuperative powers to so low an ebb that the individual has never been completely restored to health. It is to this fact that I attribute the larger number of failures of health in the period of foreign service after the first furlough, where the said furlough has been delayed beyond seven, and in some cases ten years.

Anything that destroys or lowers the balance of general health predisposes to an attack of malaria; thus the exhaustion produced by heat, and especially by exertion in heat, often brings on a fresh attack of fever, or induces a primary attack. Other diseases, exhausting evacuations, and debauchery all have a share in inducing malarial disease. Indolence has a very marked effect in this connection; excessive indulgence produces satiety and a debility which tends to indolence; and inactivity of mind has its effect on the moral as well as on the physical nature, and is a fruitful predisposing cause of disease. It is an axiom in India that the only way to be healthy during the hot weather is to be busy. A very frequent cause of illness is a chill, for though chills do not produce fever they certainly induce it. Punkahs are a very common cause of chills. They do not lower the temperature, but keep the body cool by keeping the air in motion. The least exertion in the hot weather causes violent perspiration, especially if one is away from the draught of the punkah: and when one is again within its range, rapid abstraction of heat is followed by chill. At night chill is still more common. The nights are sultry and stifling, even with the punkah, and quite intolerable without it. But it frequently happens that the punkah-puller falls asleep, and as soon as the fan stops the bodies of those sleeping under it become bathed in perspiration; in a few minutes the punkah-puller awakes, or is awakened, and pulls violently—the result is a thorough chill. If the punkah is bad, other heat-alleviating appliances which act by directly lowering the temperature of a room are infinitely

worse. Chief amongst them are Thermantidotes and Tatties; in both of these air is cooled by being passed over or through water, and is then conducted into a room. The effect is very marked. A room with a temperature of 100° falls to 75°, and is easily maintained at that heat: but the cooled air is also laden with moisture, and is fruitful of disastrous chills. The irrational life too often led by Europeans in the East is also a powerful factor in the production of malarial disease. After a troubled hot night many people rise at 5 A.M., when breakfast is taken. This is in the *déjeuner à la fourchette* style: there are usually many dishes, highly seasoned, and as the day wears on the combined effect of these and of the heat is to cause thirst, which is aggravated, not relieved, by pegs—a variable amount of brandy or whisky taken in soda-water. Lunch (*tiffin*) at about 2 P.M. is another breakfast; the heavy meal is not conducive to refreshing slumber, and so the afternoon siesta is as troubled as is the long night after a heavy dinner at 8 P.M. All people do not live in this way; of late years there has been steady improvement, and a much more rational mode of life is now in vogue, but there is yet room for improvement in food, drink, and social customs. Abroad we are too much wedded to the traditions of home, and not unnaturally so; but we too often find that habits which, if not actually beneficial, were at all events innocuous in our cold northern clime, are not only unsuited to our new surroundings, but positively hurtful. To most men in India the life is one of intensely hard work under unhealthy circumstances, and the true secret of life is by every means to economise brain and nerve power, and by suitable changes in diet and habits to adapt oneself to the new surroundings.

Into the treatment of diseases caused by malaria it is not necessary here to enter. The preventive treatment of malaria itself falls under two heads—general measures tending to prevent the production of malaria, and special treatment calculated to fortify the individual against it.

The former must be based on the conditions necessary to the existence of the poison, namely, a certain degree of temperature, a certain quantity of moisture and air, and a peculiar condition of soil. In the absence of any one of these the production of malaria is impossible. It may be checked by the temperature falling below 20° C., or by prolonged heat drying the air and soil, or, again, by the exclusion of air from the soil.

Thermal conditions are beyond the control of man, but they should not be neglected. Many lives may be saved if the right time or season be chosen when an army or expedition has to traverse malarial wastes. Moisture is much more under our control, as we can withdraw it from the soil by drainage. But in all drainage schemes we must provide not only for the surface water, but also for the more dangerous subsoil water, and in all systems of irrigation in tropical lands the water after fertilising the soil should be allowed to run off. Where this water cannot be carried off, the supply should be so regulated, according to the nature of the soil, that it may be evaporated, and not go to increase the subsoil water. In India many thousand miles of waste land have been turned into fruitful ground by an elaborate system of canals; but in the absence

of subsoil drainage they undoubtedly become a source of sickness and death to many thousands of people.

Where drainage-works may be impossible, or may be too costly, we may achieve the same object by judicious training of rivers by means of embankments, and we shall thus be enabled to protect great tracts of land from inundations when rivers are in flood, or from the invasion of water at other times. Such simple methods may often accomplish all that drainage would do.

If none of these methods is applicable, we may withdraw another of the factors needed for malaria-production by preventing access of air to the soil. We have remarked that rice-fields—one of the worst haunts of malaria—are perfectly safe while covered by the water needed for the growth of the young crop, and that the dangerous time is when the harvest has been garnered and the fields have dried. And such is the case also with other lands, the virulence of the disease increasing as the drying process advances. The explanation of these facts is, that air being unable to reach the soil through the covering of water, malaria-production ceases. We can imitate this natural process, and attain the same object, by flooding all dangerous lands. I have in India seen large tracts of low-lying, swampy ground near cities, valueless for crops, grazing, or building, and a fruitful source of malarial disease, which might by flooding be turned into ornamental waters, might be used for bathing and boating, and, if stocked with fish, might become a permanent source of supply of a much used and highly valuable article of diet. With a little damming, and, as in many tanks in India, a simple arrangement to ensure a constant inflow and outflow of water, the same level could be always maintained; and thus land that is now an eyesore and a cause of much suffering might, at small expense, be converted into a source of great benefit to the community.

Where it is impossible to flood malarial spots, they may be covered deep with earth; but this plan, though it has been extensively tried in Amritsar, is not to be recommended. Not only is it very expensive, but the digging and upturning of large masses of soil is in itself a source of danger to the community; and as the new earth receives rainfall, and subsoil water rises into it, it may, in its turn, become a focus of infection. Lands reclaimed by covering with soil should never be allowed to lie fallow. In Amritsar, such ground is largely utilised for market-gardens, and thus a welcome addition of food is supplied to the teeming population of the city, and the profits derived go far towards defraying the cost of the original works. But the difficulty is that in tropical lands it is impossible to grow crops without constant irrigation, and thus the new soil is being gradually soaked, while the subsoil water continues to rise; and I believe it will in time be found that the form of cultivation adopted has rendered nugatory the remedy of covering the malarial spots with soil.

Clearance and cultivation are important measures, and of very great value to the permanent reclamation of land. It has elsewhere been pointed out that, while ultimately these measures must prove beneficial, yet the denudation and upturning of the soil may be for some time

followed by most fatal results, and that the true secret of achieving the desired object safely is to clear the ground by thinning the forest very slowly, never more than can be immediately occupied by crops, so that the ground may never be left bare.

A measure of special hygienic importance is the planting of trees. Belts of trees judiciously planted are of the greatest service. By absorbing carbonic acid and giving off ozone, they purify the air of a locality. In malarial districts they have a special value—not only do they shade and screen the soil, but, according to some, they directly absorb malaria. However that may be (I do not myself believe it), they undoubtedly intercept the poison, and thus mechanically act as preventive agents. In planting such belts of trees, regard should be had to malaria-producing localities and the direction of the prevailing winds: for if trees are planted in a wrong position they may guide malaria into dwellings and cities instead of warding it off. Of suitable trees there is no lack in the East. The tall, stately forest trees with dense foliage are undoubtedly the best. Those technically known in forestry as "the light-demanding" species are unsuitable. Their thin crowns have a tendency to open out, allowing the light to penetrate very readily to the soil, and intercepting only a fractional part of the rain. Typical trees of this kind are the various species of *Dalbergia*, acacia, palms, and many others of the most valuable Eastern forms. The trees chosen should be of what is known as the "shade-bearing" species, with dense crowns, which effectually screen from malaria-laden winds, intercept a large proportion of the rainfall, and completely protect the earth from the sun.

In this shade-bearing category there is a very large number of majestic trees, valuable alike for beauty and shade, for timber, fruit, and other economic products. I may instance the *Ficus Indica* (*Banyan*), the *Ficus religiosa* (*Peepul*); and, amongst fruit-trees, the noble mango and others of the *Anacardiaceæ*.

In this connection I must refer to the *Eucalyptus* (*globulus*, *serratifolia*, and other varieties), which has been supposed to exercise a specially beneficial effect in malarious lands by its specific action on the soil, and also by the exhalations which emanate from it. It has been tried and found wanting. It has no more influence *per se* on malaria-production than another plant, the common sunflower (*Helianthus*), for which large anti-malarial powers were claimed at one time. In Australia, the natural habitat of the eucalyptus, malaria prevails extensively—at all events in the centre of the island, and in the northern portions, as proved by Professor Liversedge of Sydney (*Lancet*, vol. ii., 1884, p. 797). Professor Tommasi-Crudeli shows that, in the Roman Campagna, at the Tre Fontane, where the eucalyptus was extensively grown, there was a singularly bad outbreak of malarial fever in 1882, while the surrounding villages were free from disease (*Lancet*, vol. ii., 1884, p. 797). The fact appears to be that, as the tree will not grow in a watery soil, an elaborate system of drainage has been found necessary, which would have had just as great an effect without any eucalyptus at all. In India the tree takes kindly to the soil, and is largely grown. It is ornamental, and its timber is hard and valuable, but it affords no protection against malaria. It is essentially a

"light-demander," and its thin crown gives shelter neither to man nor beast nor soil, and is as useless in this respect as the poplar.

But there is one plant of exceptional value, which has not hitherto received notice. I am, I fancy, the first to draw attention to its unique capabilities in the reclamation of malarious lands. I refer to the plantain tree, the banana, as it is called in the New World—*Musa paradisiaca* (plantain), *M. sapientum* (banana), and *M. Cavendishii*. It is indigenous in all tropical countries, and is so rapid in its growth, that it arrives at perfection in a few months. Its cool, deep green leaves are a most refreshing sight in the hot weather; it is a graceful plant, and with its flower and fruit and leaf forms one of the most beautiful objects in a tropical land. Its fruit and fibre are of very high economic value. It grows in dense clumps on almost any soil, and needs neither clearing, weeding, manuring, nor attention of any sort. Once planted, it continues to propagate itself without any attention; it is subject neither to blight nor disease. The special value of the banana in malarious countries is due to its immense capacity for absorbing water. It can be planted in the most waterlogged soil, which it effectually drains. When it dies, inasmuch as most of its bulk is nothing but water, it rapidly dries in the powerful sun, and the dry *débris* enriches the soil without the concomitant evils and noisome odours that arise from the decay of other vegetable matter. I have yet to make a further and more detailed series of observations and experiments before I can formulate definite propositions and give statistics concerning it.

Personal safeguards must be adapted to the peculiar circumstances of each case. In addition to a proper diet, avoidance of exposure to heat and cold, especially when fatigued or in need of food, and the avoidance of infection by a due regard to the seasons and the factors that go to the production of malaria, suitable clothing must be worn: chill is the greatest enemy of health in hot countries, and therefore it is important always to wear flannel or woollen clothes next the skin, and to use sufficient covering at night. The danger of malarial infection may also be diminished by giving due consideration to the prevailing winds, and making encampments to the windward of malarious spots, or screened from them by a belt of trees or expanse of water. Double-walled tents confer great protection, as also mosquito-netting, and the habit, universal amongst the natives of India but not possible to us, of sleeping with the face and head quite covered by the bed-clothes. All water used for drinking purposes, and also milk, should be boiled. Coffee used habitually has a decidedly prophylactic effect, and so, I am inclined to think, has tobacco. The smoker creates around him an artificial atmosphere, warm, dry, and not easily penetrated by unwholesome smells. Moreover, the practice of smoking, when moderately indulged in, soothes and tranquillises the nerves, producing a state of mind in which the person is less predisposed to contract disease, helps to conserve nerve energy, and discourages the attacks of mosquitos.

More direct methods of *prophylaxis* are to be found in the administration of various drugs. According to the views of some, the production of malaria can never be satisfactorily controlled by us, and the victory can

only be won by rendering the system of those exposed to the infection impregnable to its attacks. This end it is sought to attain by the systematic use of anti-periodics. Quinine may be regularly taken with advantage at all times in tropical lands, and it ought to be taken when malaria is rife. Crudeli prefers arsenic, but my own experience is that this drug is uncertain in its action and apt to cause gastric disturbance in the weak, anæmic, and ill-fed. On account of its active properties, its administration has proved to me to be an anxious matter. It is not possible to trust arsenic in the hands of natives, whose ideas of medicine are of the haziest description, and who are quite capable of poisoning the patient through ignorance.

SOME ANCIENT LANDMARKS OF MID-LOTHIAN.

(With Map.)

By Henry M. Cadell, of Grange, B.Sc., F.R.S.E., etc.

The close connection between geography and geology has often been insisted on in the pages of the *Scottish Geographical Magazine*, and perhaps one of the most interesting examples of this relationship is to be found at our very doors, in the midst of the hills and dales of the Modern Athens. The oldest reliable map of Mid-Lothian seems to be that of Timothy Pont, published during the reign of James VI., about 270 years ago. Since that time the face of the country has undergone many alterations. Wide expanses of peat-moss have been reclaimed, forests have been cleared away, and barren moorlands have been drained and converted into smiling meadows or tracts of rich agricultural land.

The time of which I wish now to speak, however, goes much further back than the Union of the Crowns. It even antedates the period of the Roman invasion, and the formation of the 25-feet beach which indicates the last upheaval of the land or retreat of the sea. The population of Scotland was then insignificant, and our savage ancestors were too few and too ignorant of the arts of peace to exert any important influence on the external appearance of Caledonia, the greater part of which remained a land of brown heath and shaggy wood until a much later period. All the changes that then took place were brought about by the slow agencies of Nature that have, ever since time began, continued to wear down, level up, and smooth over the natural roughnesses of the rocky crust we live on.

Could one of the old residents of 2000 years ago return and give us the benefit of his impressions about the principal changes in the face of the Edinburgh district since his day, he would no doubt, in the first place, note the disappearance of several conspicuous sheets of water from the neighbourhood. He would next sigh for the ancient forest of Drumsheugh, where he was wont to chase the wild boar, deer, and wolf, and would

probably be much astonished, on going down to the Firth of Forth at Cramond, Leith, or Portobello, to find that the sea had gone back permanently several hundred yards, leaving exposed broad tracts of sandy foreshore over which he had in his youth paddled his coracle at the lowest tides in search of fish or oyster beds.

The disappearance or notable diminution of the ancient lakes in the Edinburgh district is a subject of much local geographical interest, and I shall now endeavour to examine some of the evidence on which their former existence is inferred, and show on what principles the accompanying prehistoric map of the district has been constructed.

It requires but little reflection to arrive at the conclusion that lakes are, geologically speaking, one of the most evanescent features in the scenery of a country. The reasons for this are mainly twofold.

In the first place, most lakes, and indeed all the lakes in our latitude, have an outflowing stream to carry off their superfluous waters. Running water has a strong tendency to wear down the bed of the channel over which it flows. If it is clear and free from sediment, this tendency is not always very pronounced, as it is the hard particles in the river that do most of the grinding of the rock below, and the friction of pure water alone is geologically of little importance. Where, however, the effluent stream falls over rapids or rocky barriers of varying hardness, waterfalls are formed which constantly eat their way backward towards the sources of the river. In this way the exquisitely clear, green waters of the Niagara are steadily eating the falls back towards Lake Erie, and the equally pure river of the Yellowstone is excavating its magnificent falls and pushing them up the cañon towards the noble lake in the plateau above. The final result of this process is the drainage of the parts of the lake above the level of the outlet. An excellent example of the partial drainage of a lake basin in this way is supplied by the case just cited of the Yellowstone lake, an account of which is given in this *Magazine*, vol. viii. pp. 247-8. The geological map of the Yellowstone Park at p. 236 shows the outline of the ancient "Lake Hayden," which was tapped by the Yellowstone river and partially dried up at a comparatively recent period, the present Yellowstone lake occupying the part of the depression not yet reached by the receding waterfalls.

But this is not the main cause of the temporary character of lakes. It is not so much the outlets as the feeders that sow the seeds of their decline and death. Lakes act the part of filters to the rivers that flow through them, and as filters become choked up and useless after a time, so do these great natural strainers become choked with the sediment that is constantly poured into them. Sediment can only be carried in water that is moving at a certain rate, and as the force of the current diminishes, the suspended particles begin to sink to the bottom—the coarser first, and the finer grains afterwards. Every stream that enters a lake brings down its quota of stones, sand, and mud, and drops them as it enters the quiet water, which thus acts as a natural filter. In this way sediment constantly accumulates in the basin of the lake—the water that issues at its lower end being no longer turbid, but clear and limpid. An ordinary map of any of our Scottish lochs shows generally a tongue-like promontory

at the mouth of each of the larger streams that feed it. There is, for example, a conspicuous projection of this kind at Lower Inveruglas, where the Douglas Water enters the west side of Loch Lomond, and another at Ardgarten, where the water from Glen Croe is discharged into Loch Long. If, as is usual, the largest feeder flowing down the main valley enters at the head of the loch, the mouth of the stream is generally found to meander sluggishly over a flat plain, partly meadow and partly marsh, liable to frequent inundation. The Dochart and Lochy, for instance, enter Loch Tay through a plain which, on a geological map, would appear as alluvium swept down and deposited in the form of a delta at the mouth of the river. A stream entering a narrow lake at one side is generally seen to shoot out a fan-shaped delta, which, if the amount of material transported from the higher ground be large, sometimes extends right across the valley so as to form an embankment which cuts the basin into two parts. A well-known example of this phenomenon occurs in Switzerland, where the town of Interlaken, as its name implies, stands between the lakes of Thun and Brienz on a broad bank of alluvium discharged by two rivers from nearly opposite sides of the valley into what was originally a single long lake basin. Another and perhaps more familiar instance of this bisection and subdivision of a narrow loch by the agency of lateral feeders is to be found in Strathyre, which was once occupied by a single long tortuous sheet of water stretching all the way from its outlet at the Pass of Leny to the foot of the Braes of Balquhidder, and which is now represented by the three basins of Loch Lubnaig, Loch Voil, and Loch Doine—detached basins differing but slightly in level, and separated by alluvial haughs or fans spread out by the torrents from the adjoining mountain slopes. Many of our smaller Highland lochs have in this way completely disappeared from the landscape, and are now represented by flat alluvial meadows or haugh lands, through which the river winds peacefully, carrying down materials to fill up the next basin that may present a convenient "free toom" for its waste products.

If all our lakes are thus diminishing in size, it is clear that at some future date they will become entirely obliterated, and the geologist of the future will only be able to infer their former existence by such evidence as he can collect either from human records or from physical data.

It is by reasoning in this way that we are able to infer the former existence of several important sheets of water in and around what is now the site of Edinburgh, some of which are still represented by smaller lake basins, while others have disappeared within historic times, and a few have ceased to be remembered even in the traditions of the remote past.

During the long continental period before the Great Ice Age, when the British area was still a part of the mainland of Europe, any lakes which may have been previously in existence were no doubt completely obliterated. Our mountains and valleys were at that time all in existence, but no sparkling lochs lighted up the landscape. The rivers hurried down from their mountain cradles through deep glens, sweeping their load of sediment away to the distant sea without ever meeting a temporary asylum wherein to rest and wash off the stains of their weary

pilgrimage. When the vast glaciers of the Pleistocene age, after hugging the land in their long, rude embrace, at last melted away, they left the whole face of the land sprinkled over with multitudes of sparkling pools and freshly cut rock basins in the bosom of the hills. Most of the lochs in the Lowlands were formed by dams of detritus or hollows in the surface of the glacial drift; and as time went on, these, being chiefly shallow, were the first to disappear. The brooks that fed them brought in quantities of stones, sand, and mud from the higher grounds, as well as twigs and leaves from the forests that clothed their banks. In this way most of the lowland lakes were gradually silted up, and eventually a dense growth of pulpy peat not infrequently overspread their sites and gave rise to swampy bogs and quaking flow-mosses that continued to flourish for many centuries. At places where the water remained clear for lengthened periods, molluscs lived for ages, and their delicate shells accumulated in myriads upon the oozy floor. As time went on, beds of white calcareous shell marl were thus built up, and the presence of this characteristic deposit is one of the best evidences of the former existence of a lake at any place. When we find a smooth, flat hollow, surrounded by higher ground, and showing free, loamy soil devoid of stones of any large size, and, perhaps, a sluggish stream creeping softly across it, there is good reason to infer the presence of an old lake. If, moreover, on digging a few feet beneath the surface, we come on beds of peat, silt, laminated clay, gravel, fine sand, or shell marl, this inference is proved to be correct, and all doubt is removed as to the lacustrine history of the place.

From all the evidence, both historic and geological, we can now clearly demonstrate the former existence of seven more or less conspicuous sheets of water in the neighbourhood of Edinburgh. These "seven eyes" of ancient Dun Edin were as follows:—

1. Gogar Loch.
2. Corstorphine Loch.
3. Craigcrook Loch.
4. The Burgh Loch.
5. Holyrood Loch.
6. Lochend Loch.
7. Duddingston Loch.

Of these only three are now represented by sheets of water, namely, the lochs of Craigcrook, Lochend, and Duddingston. There were in addition several smaller pools or "dubs," which hardly deserved the name of lakes, situated at Canonmills, Morningside, the north-east of Blackford Hill, Hailes Quarry, and perhaps also in Hunter's Bog, between Arthur's Seat and Salisbury Crags. It may be remarked by readers acquainted with Old Edinburgh that the Nor' Loch is not included in the list; but there is no evidence that this lake had any existence prior to the year 1450. Like St. Margaret's and Dunsappie in the Queen's Park, it was of artificial origin. The valley north of the city, in the reign of David II., who flourished in 1144, formed part of the king's gardens, and was used for tournaments, sports, and military parades. In 1450 a dam was thrown across it, and the waters of the little stream issuing partly from the spring at the

Wellhouse Tower, and partly from the rising ground to the west, was impounded to save the expense of building a wall along the north side of the city. The Nor' Loch existed for three centuries, the outlet on the site of the present Waverley Station being regulated by a sluice. It latterly degenerated into a huge cesspool for the refuse and sewage of the New Town, and was drained about the end of last century, the last traces of the morass, along with other public nuisances in the vicinity, being removed in 1816 for the sake of the amenity of Princes Street.

1. Gogar Loch.

The configuration of the ground between Gogar Burn and Corstorphine points to the former existence of a shallow lake about $1\frac{1}{4}$ miles in length, stretching along the flat hollow north of, and roughly parallel to, the railway. There is not much historical or geological evidence from excavations as to this old lake. That it existed in historic times is, however, clear, as it is shown on Pont's map, already referred to, and in John Adair's map of 1680. It is also indicated in John Elphinstone's map of the Lothians, published in 1744, a copy of which is in my possession. It cannot, within the last three centuries at all events, have been a lake of much note, and was probably little more than a bog when these maps were made. Reference to the bogs and marshes in the meadows at Gogar is made in the narratives of Cromwell's and Leslie's marches in 1650; and in July 1661 James Forrester presented a petition to Parliament in which he complained that "the whole meadow ground and low-lying lands was undone by the overflowing of the Gogar-burne, and that, partly through the neglect of those who formerly were accustomed to cast and keep clear the ditches and stanks through which the water did naturally pass, and partly by the inbreaking of the said water in the lands of Redhewes." The Gogar Burn may at one time have flowed eastward along this hollow to join the Water of Leith at Coltbridge, and may in course of time have brought down so much mud as to fill up the west end of the lake, and then find a new outlet into the Almond on the west. The ground is, however, so flat that it is equally probable the stream may have merely overflowed into this depression, the main portion of the water escaping by its present course into the Almond. Pont's map shows the burn flowing northwards past the loch in this direction. On the 2nd edition of the 1-inch geological map (sheet 32), just published, the probable original area of this loch is marked as an alluvial plain; and this forms the basis on which I have reproduced the lake on the map accompanying this paper, and have shown the Gogar Burn flowing into its western end.

2. Corstorphine Loch.

The ancient loch of Corstorphine must have once been a feature of considerable importance in the landscape, as its existence is proved by both historical and geological evidence of a very conclusive kind. It seems to have been originally separated from Gogar Loch by a flat tongue

or ridge of boulder clay, and to have extended for a distance of nearly three miles from the vicinity of Broomhouse to the present Haymarket goods station, the original margin coinciding almost exactly with the 150-foot contour line on the Ordnance map. Both of these lakes are referred to in the *New Statistical Account of Scotland*, vol. i. p. 245, and are shown on the old maps of the district. Elphinstone's map shows that during the century preceding 1744 the area of water had become greatly diminished. The draining of Gogar Loch was carried out about 1766, as it is not shown on maps of later date; and Corstorphine Loch was partly drained and reclaimed in 1670, when the deep ditch known as the Stank was excavated along its northern side. The final reclamation was completed in 1837, when the Stank was deepened and enlarged to prevent any further flooding of the rich alluvial floor of this ancient lake. The Castle of Corstorphine was built on the neck of dry land between the two sheets of water, and for many centuries must have thus occupied a position of considerable strategical importance. The once celebrated Forresters, Lords of Corstorphine, to whom the castle belonged, are said to have brought their provisions by boat from Coltbridge; and it was their interest to prevent the lake from being drained so long as their enemies were to be kept at bay and the strength of the fortress maintained. Dr. Taylor, in his interesting little volume, *A Mid-Lothian Village*, says that sometimes the tongue of land between the two lochs was partly submerged, the passage across being maintained by a ferry; and there is a tradition that at no very remote date a beacon-light used to be fixed up on the gable end of Corstorphine Church to guide benighted travellers safely across the dangerous morass.

The recent deep cuttings through the district in connection with the Water of Leith purification works, as well as some excavations during the construction of the Forth Bridge Railway, near Corstorphine station, have revealed many interesting sections of the deposits found in this old lake. Mr. James Bennie, of the Geological Survey, has made a careful study of these and other old lacustrine deposits, and has given an account of them in the *Proceedings of the Royal Physical Society*, vol. x. p. 133. In a cutting 7 feet deep, on the farm of Broomhouse, for a culvert below the Forth Bridge Railway, the subsoil was found to consist of lake silt and peat. The silt was, Mr. Bennie says, crowded with fresh-water shells and *ostracoda*, and the peat, being composed chiefly of the stems of aquatic plants, was essentially a water peat. The recent excavations for the Water of Leith purification works, in which large sewers were laid westwards from Coltbridge to Corstorphine and southwards across the bed of the lake towards Gorgie, revealed a well-marked series of beds of silt, laminated and brick clays, sand, gravel, and peat, as well as occasional marl deposits, which show clearly that for long ages after the Glacial period this remained a lake of considerable importance. The sediment which helped to fill it up was no doubt chiefly contributed by the Water of Leith, which crosses its eastern end between Gorgie and Coltbridge; and it is probable, as the old maps indicate, that, being nearest the source of deposition, this end of the lake was the first to disappear. The lowering by natural erosion of the boulder-clay barrier across the outlet

at Coltbridge would also diminish the level of the water, and aid the stream in obliterating this ancient landmark from the district.

3. Craigcrook Loch.

This lakelet, situated in the hollow at the foot of the eastern slope of Corstorphine Hill, north of Craigcrook Castle, is now represented by a small, reedy pool on the east side of the road from Ravelston to Cramond. So far as I have been able to learn, it is not referred to in any description of the locality. Had it ever been a lake of importance, reference would have been made to it in Wood's very accurate *History of Cramond Parish*. It is, however, marked on Pont's map, and the configuration of the ground shows it to have once covered a much larger area than that of its present insignificant representative. The lake was, I believe, drained by a culvert leading northwards to the low ground near Davidson's Mains, but the original outlet must have been the burn running eastwards along the hollow through Blackhall and past the north side of Craigleith Quarry and Comely Bank to the Water of Leith. The road from Ravelston, referred to above, crosses part of the old lake bottom; and the field adjoining is locally known, I believe, as the Marl Pits, from the deposit of shell marl found by digging a few feet deep in this flat ground, which on the map is included in the old lake area.

4. The Burgh Loch.

This sheet of water, which was in existence up to the beginning of this century, occupied the site of the present Meadows. There was once a tradition about a lake in the neighbourhood of the Cowgate called the South Loch; but this tradition seems to have been founded on no conclusive data, and Maitland, in his *History of Edinburgh*, published in 1753, seems to have made out that the South Loch and the Burgh Loch were one and the same lake. There may have been in prehistoric times a few marshy pools along the hollow of the Cowgate and Grassmarket; and, indeed, Mr. Bennie mentions the occurrence of a black mud, with some aquatic plant remains, revealed in cutting a sewer at Bristo Port; but such "dubs" were no doubt once abundant in the district, and do not deserve special mention here.

The Burgh Loch and its marl and peat beds have been described by Hugh Miller and other writers. The marl, which was at places three feet or more in thickness, contained abundance of the delicate shells of *Limnæa*, *Valvata*, and *Pisidium*, as well as occasional specimens of *Planorbis*, and several species of ostracods, most of which forms are abundant in the marl of the other old lakes of Edinburgh. A list of these by Mr. Thomas Scott is appended to Mr. Bennie's paper, already referred to. The water of this lake was once used for domestic purposes, and a windmill was erected to pump it for the use of the brewers of the Society established by James VI. in 1598. The draining of the loch was begun in the early years of the seventeenth century. In 1722 it was let for £800 Scots on

a fifty-seven years' lease to Thomas Hope of Rankeillour, who began to drain it more perfectly, and converted it into a marsh, with a walk round it. It remained, however, a morass till 1840, when the water was finally completely drawn off, and since the first walk was constructed has remained a public resort, formerly patronised by the wit, beauty, and fashion of the Modern Athens. The surface of the ancient lake-bed was, like that of the Nor' Loch, for many years used as a "free toom" for rubbish, so that it is now raised several feet above its original level, and the uninitiated may therefore at first sight have some difficulty in realising its ancient lacustrine character. Modern improvements have so modified the appearance and levels of the surrounding ground that it is somewhat difficult to picture to ourselves the position of the ancient outlet for the surplus water when the loch overflowed, as it occasionally did. The Burgh Loch is not shown on Pont's map, nor is there any indication of a stream in the neighbourhood; but any effluent there was probably found its way westwards, and escaped into the east end of the Corstorphine Loch in the vicinity of Dalry.

5. Holyrood Loch.

The greater part of this lake is unknown to history, and the evidence on which its former existence is based is principally geological. There is, however, some reference made in old descriptions of Holyrood to a lake or piece of marshy ground at the foot of Arthur's Seat, along the edge of the old Palace gardens: and from an entry in the Lord High Treasurer's accounts it appears that the "loch beside the Abbey" was drained some four hundred years ago, in the time of James IV., as a site for a garden.

The ancient loch of Holyrood must have nearly all dried up and disappeared long before the Abbey was founded in the beginning of the twelfth century, as King David, the "sair sanct," was not likely to choose a soft morass on which to erect such a noble edifice. The configuration of the ground shows that the Abbey and Palace are situated right in the middle of the original lake basin, which had a rudely triangular shape, the longest side stretching north-eastwards along the foot of Salisbury Crags to the vicinity of Spring Gardens for a distance of about two-thirds of a mile.

Numerous excavations have from time to time been made in this flat area, and have been described by Mr. Andrew Taylor[1] and Mr. John Henderson[2] in the *Transactions of the Edinburgh Geological Society*, and by Messrs. J. A. Johnston and J. Lindsay in the *Transactions of the Edinburgh Naturalists' Field Club*.[3] I have myself also had opportunities of examining some of these sections before they were covered up, and it would be difficult to get a better example of a typical lacustrine flat in any part of the Edinburgh district. The best sections were revealed in the bores and excavations for one of the large gasometers at the South

[1] Vol. v. p. 44. [2] Vol. v. p. 407. [3] Vol. ii. p. 135

Back of the Canongate. In one of these bores the following strata were pierced :—

	Ft.	In.
Forced material at surface,	3	2
Yellow clay,	2	4
Peat,	3	0
Marl,	9	0
White and brown mud,	2	6
Blue and red clay,	1	9
Rough gravel,	4	6
Clay and small stones,	5	6
Blue clay,	7	7
Depth to rock,	39	4

In this section we have typical lake deposits to a depth of about 26 feet below the present surface, the lowest beds being probably glacial drift of more ancient origin.

The variable local character of these old lake beds was well shown in the deep excavation for the gasometer tank. A careful section was drawn by the engineer in charge of the work, a copy of which in my possession shows that the rock surface was covered by a bed of marl, varying in depth from about 2 to 5½ feet. This was overlaid by a bed of peat less than a foot in thickness, above which came a thick stratum of "till," or rough stony clay, probably washed down by torrents from the adjoining steep talus of Salisbury Crags. At the north-west side of the tank the till was covered by a second bed of marl, showing that the floods gave place to a drier period, in which the water remained sufficiently tranquil for the delicate molluscs to flourish in peace. This marl, however, only covered part of the area, and passed into a bed of grey and yellow sand, 3 to 4 feet deep, along the south-east side of the excavation. The whole was overlaid by a covering of vegetable mould 5 to 8 feet thick, the greatest depth of the whole section of lacustrine strata at the south-east side being about 34 feet.

In the beginning of 1887 a cutting several hundred yards in length was made for a sewer running north-eastwards from this point past the Palace gardens, in which a section at places 20 feet deep was laid bare. Mr. John Henderson, in his description of this cutting, states that the surface to a depth of about 6 feet consists of artificial deposits, with fragments of pottery, oyster-shells, bones, etc., resting on brown, peaty clay about a foot in thickness. This bed passes down into peat, which has at places a depth of 18 inches, and all along the section rests on marl 1 to 2 feet thick. The lowest part of the section consists of brown and blue clay resting on loose clayey sand, which seems to have here formed the floor of the lake.

From these sections it is clear that the ancient loch of Holyrood had originally a depth of between 30 and 40 feet at places, and that after several vicissitudes in climate it became silted up with material brought down by streams from the adjacent high ground. One of these brooks probably ran northwards along the hollow encircling the base of Salisbury

Crags along the line of the Queen's Drive, and a second entered from the west, carrying down the drainage of the valley between the Castlehill and the Calton, afterwards partially occupied by the Nor' Loch. As the lake shallowed, the fauna which flourished in the deeper water was choked out, and the area became overgrown with peat, only a few pools remaining to mark the place in historic times. The peat was full of twigs of birch, hazel, and other trees, which no doubt at one time formed part of the thick forest of Drumsheugh, whose gnarled oaks and sombre pines once cast their dark shadows across the bosom of this ancient lake.

6. Lochend Loch.

Of all the old Edinburgh lakes this little one seems to have undergone least change since the earliest times. It has no streams of any consequence for feeders, and hence has not become silted up. The water seems to be derived chiefly from springs, and as such is clear and free from sediment. The outlet to the west is small, and although the level of the overflow may have been somewhat lowered, there is not much evidence of any considerable shrinkage in area.

7. Duddingston Loch.

Although still the largest of the Edinburgh lakes, Duddingston Loch covers but a fraction of its original area, and the merest tyro in field geology can see that about half of the present lake has recently degenerated into a reedy marsh, which will at no distant date gradually become dried up and disappear in the ordinary course of nature. The level of the water is but a few feet below the 150-feet contour line, and by following this line we can approximately trace out the ancient margin. As all skaters know, this loch is supplied principally by springs rising at the foot of the Hangman's Rock and the Girnal Crag, and the outlet passes south-eastwards into the Braid Burn near the railway station. The ancient lake probably extended over the whole of the flat depression between Duddingston and Inch House; and although it is not certain that the slight knoll on which the old mansion-house stands was actually ever a complete island, as its name would imply, yet it may have been near enough the water in Celtic times to have been described by that common epithet.

The ancient loch was supplied partly by the existing springs and partly by the waters of the Braid Burn and its tributary the Pow Burn, which join near Peffermill, and probably at first entered by separate mouths into the basin. These streams, in their original state before modern improvements had altered their courses and the character of the surrounding land, were no doubt subject to powerful spates. Large quantities of alluvium were swept down on these occasions from the high ground of the Braids and Blackford Hill, and deposited, where the current slackened, in the form of a flat delta at this end of the lake. Gradually the alluvial fan pushed back the water and spread over the greater part of the shallow basin, until at last this part of the depression was

completely silted up, and the streams, uniting into one, parted company with their shrunken old friend the loch, and, passing it, left it to be maintained entirely by the springs and the rills from the adjacent slopes of Arthur's Seat. The southern part of the basin, whose total length at the end of the Ice age apparently exceeded a mile, was probably shallow, and the silting-up was a comparatively rapid process, so that many centuries must have elapsed since the loch shrunk nearly to its present area. The deepening of the outlet by artificial means has no doubt helped further to reduce it within historic times. It would, however, be an advantage if the hand of man, instead of, as usual, assisting in the destructive work of nature, were to be employed in partially restoring the ancient majesty of this sheet of water, by clearing out the reeds and sedges by which it is nearly half occupied—a work which would be both patriotic and practical, and would, besides adding to the beauties of the district in summer, give additional room in winter for skating and the grand old Scottish game of curling.

Of the smaller pools or ponds in the district to which I have already alluded, the map shows two along the course of the Jordan Burn. One of these, which occupied the hollow south of Morningside Asylum, is represented by a well-marked series of lacustrine strata, exposed when the Suburban Railway cutting was made. Under the surface vegetable soil, which had a thickness of 2 feet, a bed of peat 3 feet thick was found resting on shell marl 2 to 3 feet in depth. The peat and marl extended along the cutting for nearly half-a-mile westwards from the Morningside station to the point where the rock cutting begins at Myreside.

Another lakelet with a well-marked bed of marl existed at the foot of Blackford Hill, in the course of the Pow Burn, by which it was no doubt ultimately drained or filled up in prehistoric times. Canonmills Loch, again, was a pool connected with the Water of Leith, which occupied the hollow overlooked by the Royal Crescent. It is referred to in old maps and descriptions of Edinburgh, and was not completely removed till 1865, when the last part of it was drained during the construction of the Royal Gymnasium.

There were, no doubt, at the close of the Ice age, other lakes of greater or lesser magnitude in the immediate vicinity of Edinburgh, one of which may have occupied the flat hollow along the Burdiehouse Burn, south of Craigmillar Castle; but I have no clear evidence in these cases, and as I have endeavoured to adhere to well-substantiated facts in tracing the outlines of the old lakes of Edinburgh, these must be left out of present consideration until further investigations shall have placed their origin quite beyond the region of doubt.

This, in conclusion, is a first attempt at the construction of a prehistoric map of the Edinburgh district, and no doubt contains many defects; but it may, I hope, serve not only to awaken interest, but also to incite to further investigations in that most fascinating field of research—the borderland between the past and the present—where the geographer and archæologist step in and complete the tale of ages the geologist has left unfinished.

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

At a meeting of Council held on the 15th May, thirty Corresponding Members were re-elected.

It was resolved to confer on M. Joël le Savoureux a formal Certificate of Thanks in recognition of the interesting lecture he recently delivered to the Society on Madagascar.

The Council expressed its acknowledgment to the donors of the following works, which were presented to the Library during the quarter ending 31st March last :—

Four Consular Reports.	Presented by	T. R. Buchanan, Esq., M.P.
Pinetum Danicum.	,,	Prof. Carl Hansen.
O Clima do Rio de Janeiro.	,,	Monsieur Lamoureux.
The Aïnos.	,,	D. MacRitchie, Esq.
Handbook of the River Plate.	,,	M. G. Mulhall, Esq.
A Study in Municipal Government.	,,	Jas. Pollard, Esq.
Caucasian Calendar for 1893.	,,	M. Nicolas de Seidlitz.

Also for a number of pamphlets received from Corresponding Members and others : and to Mr. Milliken, of Kirkcaldy, who has presented to the Society a photograph of Emin Pasha.

The last meeting of the Society for the Session 1892-93, was held in Edinburgh on May 29th, when Professor Geikie delivered an address on "Glaciers, Past and Present, of the Alpine Lands."

GEOGRAPHICAL NOTES.

By W. A. Taylor, M.A., F.R.S.E.,

Librarian, R.S.G.S.

EUROPE.

The Coal Supplies of Europe.—Herr Nasse, Commissioner of Mines, has written a work on the coal supplies of Europe, in which he estimates that of Germany at 107,000 millions of tons, excluding lignite equivalent to some 2900 million tons of bituminous coal. The coal still to be extracted in the other countries of Europe he gives as 244,000 million tons, of which Great Britain possesses 195,000, France 17,600, Austria-Hungary 16,600 (?), and Belgium 14,800. Accordingly, the total supply of Western and Central Europe is 353,900 million tons, while the average annual consumption for the three years 1889 to 1891 was 326·7 million. Taking the demand in each country, Herr Nasse calculates that in Belgium, France, and Austria-Hungary the coal will be exhausted in about 500 years, and in Great Britain and Germany in 800 to 1000 years. Should, however, the total consumption gradually increase up to 790 million tons annually, the supply will come to an end in 670 years.

The Coral Islands of Podolia.—M. Em. Muller has described the Miodobarski mountains in the Government of Podolia (*Comptes Rendus*, Nos. 6 and 7). These elevations, called by the local inhabitants *Toltra*, are conical, and rise in an isolated mass from the plain. They are composed of lime, and are sparsely covered with grass. The summits are in the form of a ring, a mile and a quarter in diameter, enclosing a vast depression, the sides and bottom of which are clothed with a dense forest of pines and other common trees. At first sight the inquirer is disposed to

regard them as volcanic, but he finds that they contain no trace of volcanic rock, being composed entirely of worn coral, amongst which are enclosed remains of shells. It is evident, therefore, that they are raised atolls. They date from the Tertiary period, when the whole of South Russia was submerged beneath the waves of the ocean.

ASIA.

Captain Bower in Tibet.—On February 20th Captain Bower delivered an address to the Royal Geographical Society on his journey through Tibet (*Geographical Journal*, May). Accompanied by Dr. W. G. Thorold, he set out from Leh, and, crossing the Lanak La pass, came on July 7th to the Mangtza Cho lake in Tibet. This lake is a fine sheet of deep-blue water, lying at an elevation of 16,540 feet. The water is salt, and Tibetans come from Ladak and Noh to collect the salt which lies in incrustations round the edge. Then the party proceeded eastwards up a wide, open valley,and crossed a range running north and south by a pass 18,400 feet high. Beyond, they came to a large lake studded with islands, lying at an elevation of 17,930 feet. This was the highest lake passed on the journey, and is probably the highest in the world. Two days' march further on another lake was found, also salt, and soon after Captain Bower fell in with some nomads, with whom he concluded a bargain, and under their guidance continued his march in an easterly direction. After three days the party reached the large Aru Cho lake, at an elevation of 17,150 feet, around which grazed enormous numbers of yak and antelopes ; but there were no trees and no signs of man. Across rounded, undulating hills and wide, open valleys, with here and there sharply defined snowy ranges, the expedition travelled for several weeks, sometimes meeting with nomads, who always looked on them with suspicion, and on one occasion fired at the party. At length, in the neighbourhood of a large lake, the Chargat Cho, according to Captain Bower's map, the party was met by some Tibetan officials, who objected to their proceeding further. After long negotiations it was agreed that the caravan should be conducted to some place where water and grass were plentiful, and should there be furnished with provisions for fifteen days, while matters were settled at Lhasa. On September 5th the party set out for this place, travelling part of the way with a large caravan, consisting of four hundred yaks, fifty horses, and several thousand sheep. Being informed by some of the followers of the Tibetan officials that the men with this caravan were *chukpas*, or brigands, Captain Bower took an early opportunity of leaving their company. Presently a narrow neck of land between two lakes was reached. The lake on the north was of vast extent, and, being of fresh water, was frequented by fresh-water gulls and terns. Like all Tibetan lakes, it showed signs of having been at one time much larger than it is now. A Tibetan told Captain Bower that it was called Tengri Nor by the Mongols, and Tengri Cho by the Tibetans. It is placed on the map at about 31° 40′ N. lat. and 89° E. long. The statements, however, of a Lama, who subsequently visited the camp, are perhaps more reliable. He called the lake Garing Cho, and said that it was in the district of Naksung Sittok, while to the east lay Doba, Numru Sera, and Nakchu. In the last lies Shiabden Gomba, whence two roads lead into China—one on the north to Sining, and the other, of which the Lama knew nothing, in a more southerly direction.

Eventually it was agreed that Captain Bower should go back eight marches, and then travel eastwards by a more northerly route. Accordingly, starting on October 4th, the party left the old route on the 12th, and six days later crossed a pass 18,768 feet high. After considerable difficulties, owing to the guides being ignorant of the route, scarcity of water, and the loss of baggage animals, which

were unable to endure a temperature of −15°, with a strong biting wind, the party came once more, on November 14th, into country inhabited by nomads, and for the first time for five months camped below 15,000 feet. Henceforth part of the route late in Chinese territory and part in territory under Lhasa, though in some places the inhabitants owned allegiance to neither State. Thieves abounded, and it was only by great tact and forbearance that Captain Bower and Dr. Thorold managed to reach the neighbourhood of Chiamdo without open hostility, and with the loss of only a few packages. On approaching Chiamdo the party was met by some Lamas and the Chinese *amban* : the former objected to their passing through the town, while the latter was very friendly, but had evidently very little power, and was unable to take the travellers into Chiamdo and entertain them as he desired. Having agreed not to enter the town, but skirt it and rejoin the route on the farther side, the expedition passed on to Batang, then by Ta Chen Lu to Ya Tu on a branch of the Min river, and by water to Shanghai.

Tibet proper, *i.e.* the country under the rule of the Deva Thung, contains a population of, probably, four millions ; while Chinese Tibet, including the province of Amdo, together with Kham, which owns only a nominal allegiance to Lhasa, contains about four millions more, nearly half a million out of the total of eight millions being monks. The country is very sparsely populated, partly owing to the universal practice of polyandry, partly to the celibacy of the monks, and partly because a large part of it is only capable of supporting yaks and antelopes. The whole of Central and Northern Tibet and most of Western Tibet are known as the Chang. It consists of a high tableland surmounted by hills, mostly of a rounded form, though here and there sharply-defined snowy ranges are met with. The mountains run in general east and west ; but there is no distinct watershed ; the rivers run in all directions, and terminate in salt lakes. During five months Captain Bower never camped at a lower elevation than the summit of Mt. Blanc, and over all this distance did not see a single tree. The greater part of the Chang is uninhabitable during most of the year, and many tracts that would afford pasture in summer are too far distant from suitable winter quarters. Round the edges a few nomads are to be met with, living almost entirely on meat and dairy produce. In South-Eastern Tibet the country is very different. Here are deep valleys, steep well-wooded hills, and rivers that eventually reach the sea. The people live in houses and grow crops, but, like the nomads, are faithless, immoral, cowardly, and untruthful. Their physique is good, and they appear to be able to endure almost any amount of cold and hunger. Though less industrious and skilful than the Chinese, they are still an active and lively people. The dress of the common people is a long, dirty and greasy sheepskin, fastened by a waistbelt so that the upper part is very full, while the lower hangs down like a kilt. A straight sword, in a scabbard ornamented with silver and turquoises, is thrust through the belt across the body. The feet are covered with boots of bright striped woollen cloth, reaching to the knee and fastened by garters. The love of ornaments and jewellery is a very marked trait in the Tibetan character. The Tibetan officials refused to recognise the validity of Captain Bower's Chinese passport, and repeatedly denied that the Chinese Government had any authority in the country. The fact also that Chinese women are not allowed to enter Tibet shows that the supremacy of China must be merely nominal.

The snow and rainfall are fairly heavy, and during the short summer nourishing grass springs up, on which subsist large numbers of yak, Tibetan antelope, and *kiang* (wild ass). The only game-birds that seem to breed on the Chang are the Tibetan sand-grouse and the bar-headed goose, though in Eastern Tibet pheasants and partridges are numerous. Of insects only a few butterflies and bees were met

with, some of the former being found at an altitude of 17,600 feet. One hundred and fifteen species of flowering plants, belonging to twenty-eight natural orders, were collected. One specimen was found at a height of 19,000 feet.

The French on the Mekong.—M. Bastard, the French Resident in Cambodia, occupied Stung-Treng on April 1st, turning out the Siamese Commissioner, and then ascended to the rapids of Khong. Here the island of Khong was seized, the Siamese retiring on the invitation of the French. The plan of constructing a railway past the rapids, proposed in 1891 (see vol. vii. p. 673), will now be carried out. The Governor-General is commencing the construction of a road from Thudaumon on the river of Saigon to Kratieh on the Mekong, ninety-three miles below Stung-Treng. The telegraph line will be extended from Sambor to Stung-Treng and Khong.—*Revue Fr. et Exploration*, April 15th.

AFRICA.

The Mobangi and Shari.—M. Maistre was sent out in 1892 by the Comité de l'Afrique Française to continue the explorations of Crampel and Dybowski. The latter established a post on the Kemo (see p. 204 of this volume). From this post M. Maistre started last July with five companions, and arrived at the Lower Niger in March last, having traversed the regions which extend between Lake Tsad and the basin of the Congo. He descended the Shari, visited the south of Baghirmi, where he made treaties with the chiefs in the basin of the Logone, which he considers to be the western branch of the Shari, and then marched to Adamawa. It is not known whether he met with M. Mizon's mission.—*Revue Fr. et Exploration*, April 1st.

The Expeditions of MM. Delcommune and Bia to Katanga.—On page 94 of this volume the route of M. Delcommune was traced as far as Tanganyika. In letters to the editor of the *Mouvement Géographique*, Nos. 8 and 9, the explorer sends some details of his discoveries during the homeward journey. Starting from Mpala on October 6th, 1892, he made a detour to the south, in order to avoid the desert region between Mpala and the Lukuga, and took the direction of the village of Kassanga (Makasenga). Then, turning towards the north-east, he reached the river at Makalombi, and followed it down to its confluence with the Congo, arriving at that point on November 14th. M. Delcommune had intended to connect his outward and return routes by an exploration of the river up to Lake Kassali; but his men, whose term of service had long expired, demanded that they should be led home at once. However, he obtained from them a short delay while he made an excursion to Ankorro, a village sixty miles distant, where the Lualaba and Luapala unite. He was thus able to ascertain that Lake Lanchi has no existence, and to confirm the fact, by measurements at the confluence, that the Luapala is the main stream, judged, at any rate, by the volume of its discharge. Above the confluence the Lualaba, he was told, is navigable up to Lake Kassali, but between the mouth of the Lukuga and Kassongo there is an impassable rapid. As for the Luapala, navigation is stopped by obstructions three days' march above the confluence. Of the Lukuga, M. Delcommune writes that it is not navigable, and is of no importance as a drainage channel for Lake Tanganyika. From this river he marched westwards, and reached the Lomami a little above the Lukassi, and descended the Lomami to Gongo Lutete (N'Gongo Luita), where he heard of the defeat of the Arabs by Lieutenant Dhanis. The remainder of the journey was made by Lusambo, where the party was joined by MM. Francqui, Cornet, and Derscheid of the Bia expedition, and the Sankuru.

Dr. Briart, a member of the expedition, reports that the immense region formerly under the rule of Msiri, and situated between 8° and 12° S. lat., at a mean

elevation of 3200 feet, has dry and rainy seasons very distinctly marked, though the heat is rarely excessive. Temperatures of 90° F. or over were seldom observed, and south-easterly breezes cool the air in the dry season. On the other hand, the party had sometimes to complain of cold, for on the high plateaus a sharp wind was often experienced, and the minimum temperature fell to 6° F. On the lower plains and in the river valleys the range of temperature is less; the nights are warmer, and the air is delightful. Abundant rain falls in the wet season, but in short and violent showers, instead of pouring down for two days at a time as in Northern Europe. Dr. Briart concludes by saying that the climate of Katanga is remarkably healthy, resembling in many respects that of temperate zones. The heat is never oppressive, and the freshness of the morning braces the traveller up for the fatigues of the day.

While M. Bia was at Bunkeia there was a great famine in the country, and the expedition suffered terribly, losing 253 out of a total of 598 men. After two months of the greatest hardship, they were enabled by the ripening of the maize to move their camp to Kipuna on the Lufila, and on April 15th MM. Bia and Francqui, the only Europeans able to travel, set out with 128 men, and on the 25th reached the western shore of Lake Moëro. During the march M. Bia's health, injured by the privations he had endured, broke down, and he had to be carried in a litter. The lake is not of the importance ascribed to it by previous travellers; its greatest breadth does not exceed eighteen miles, and the south-western extremity must be displaced on maps some ten minutes to the north. Following the course of the Luapala, the expedition came to the village of Chafolonguta, opposite Kazembe. The river here is 544 yards broad, and has an average depth of 20 feet when the water is high. Livingstone, and afterwards Giraud, in travelling along the right bank, passed to the east of the lagoon of Mufwe, which they took to be the Luapala itself. The Mufwe runs along the eastern bank for a distance of 19 miles, and is 9 to 12 miles broad. From the falls of Mere-Mere (more correctly Miele-Miele) to Mpueto, below Lake Moëro, the Luapala is navigable. The river was crossed at Kafimbi, and the march was continued as far as Old Chitambo's, where a bronze tablet in memory of Livingstone, sent out by the Royal Geographical Society of London, was affixed to a tree in the centre of the village. This task accomplished, the expedition turned its steps westwards, marching 280 miles to Ntenke, where Bia died of bilious fever on August 30th. On the 14th of next month the expedition marched towards the sources of the Lualaba, which were attained on the seventh day, and found to lie only 12 or 15 miles from those of the Lufira. They are placed on maps too much to the west and south. There is no distinct line of relief between the basins of the Lualaba and Zambesi, the whole country being a vast plateau with imperceptible slopes. Descending the Lualaba, M. Francqui came to its affluent, the Lubidi, which he explored as far as 10° 30′ S. lat., and then crossed the sandy plateau where the Lubilash, Luembe, Lomami, Lufoi (or Lovoi), and a number of less important rivers, rise at no great intervals apart. Finally, as already mentioned, the party joined M. Delcommune at Gongo Lutete, having traversed a distance of 3858 miles, determined the position of 84 points, and taken more than a thousand observations of altitudes.

AMERICA.

California.—Professor Hilgard gives a sketch of the physical and commercial geography of this State in the *Verhandl. der Gesell. für Erdkunde* (Bd. xx. Nos. 2 and 3). It extends over 9½ degrees of latitude, or about the interval between Berlin and Florence. Its length, from north-west to south-east, is about 680 miles,

its mean breadth 220, and its area about 155,000 square miles. This large country is inhabited by only 1,300,000 persons, about 260,000 of whom live in San Francisco. There is therefore plenty of room for immigrants. On the east the Sierra Nevada forms a natural boundary, rising to a height of from 9000 to 15,000 feet. Its eastern flanks slope steeply down to the tableland of Nevada, which lies at an altitude of 3000 to 4000 feet above sea-level. The highest peaks lie towards the south, in the neighbourhood of the Yosemite valley, beyond which the range rapidly diminishes in altitude, and where it unites with the Coast Range has no great height. To the north it comes to a sudden stop at the upper course of the Feather river, where the low Beckwith's pass divides it from the group containing Lassen Peak, the southern outliers of the great lava fields through which the Pitt river flows. Further north these desolate plateaus rise up to the Cascade Range in Oregon, which contains a number of lofty volcanic cones. Up to a height of 3600 feet the Sierra is well wooded, chiefly with conifers, among them the gigantic *Wellingtonia*, and the foothills are clothed with a thin vegetation of firs, oaks, and bushes.

The Coast Range is a broad strip of mountain land consisting of two, or sometimes three, parallel chains, seldom much more than 3000 feet high, between which streams flow generally in a north-westerly direction through valleys as a rule broad and fertile. The rounded ridges of the Coast Range are in general only sparsely wooded on the eastern side, except in the northern half of the State, where between the ranges redwood (*Sequoia sempervirescens*) is found in great abundance. The coast itself is for the most part rocky and, owing to the almost continual westerly winds, dangerous for vessels. There are few good harbours, the land-locked Bay of San Francisco being, of course, the best.

Between the Sierra Nevada and the Coast Range the great Central Valley runs for a distance of over 400 miles, with an average breadth of 60 miles. It is a great district for cultivation, occupying nearly a ninth part of the area of the State, and nearly everywhere highly productive when irrigated. The Sacramento river descends from the north and the Joaquin drains the southern portion of the valley, both entering the Suisun Bay and pouring their waters through the San Pablo and San Francisco Bays into the Pacific. Originally the valley was the site of a fresh-water lake which, before the Golden Gate was broken through, was drained into the Bay of Monterey. Numerous remains of *Elephas*, *Mastodon*, etc., are found in the old lacustrine deposits. The valley is divided into two basins by the low Fresno plateau—the Sacramento basin, which is now quite drained, and the lower or Tulare basin, where the lake of the same name still exists, and several others have only lately been dried up through the tapping of their feeders for irrigation purposes. To the south the great valley is confined by the Tehachipi mountains, which connect the Sierra Nevada with the Coast Range. Beyond them lies the Mohave plateau, 2100 feet high, and still further south Southern California, a tropical region and the chief seat of the orange cultivation. Here the South California valley, extending from Los Angeles to Redlands, beyond S. Bernardino, is the principal cultivated district, though there are many other important valleys and some large flat tracts along the coast.

The climate is greatly dependent on the winds. The most prevalent is the south-west trade-wind which, cooled by the Alaska current, blows almost constantly, except in the winter months. Passing through the Golden Gate, the air currents flow northwards up the Sacramento valley, and southwards along the Joaquin river, lowering considerably the heat of midday. In winter the wind is more changeable. Storms, accompanied by rain, usually come from the north; east winds seldom blow. North winds correspond to the sirocco of the Mediter-

ranean, and in summer are sometimes hot enough to scorch the crops. True desert winds come from the south, and last one to three days, but in some years they are not experienced. Considering the number of degrees of latitude over which the State extends, the temperature is remarkably uniform, owing to the modifying influence of the winds from the Pacific. In San Francisco the difference between the mean temperatures of summer and winter is only about 3½° F., for the moisture borne by the trade-wind is condensed into mist in the lower strata of the atmosphere, and in the summer months the sun is often visible only during a few hours of the day. From the Coast Range this mist may be seen to disappear when it encounters greater heat and a drier atmosphere at the edge of the Central Valley ; only in winter can it reach the skirts of the Sierra Nevada. In the Central Valley the heat occasionally reaches 100° F., and temperatures of 86° to 95° are of daily occurrence in summer. But the dryness of the air prevents the heat from being oppressive, and sunstroke is unknown. In winter the thermometer falls for several weeks together below freezing-point during the night ; and, strange to say, the winter minimum at the northern and southern extremities of the valley is the same, viz. 28½° F.

In Southern California the temperature is more equable, and even on the coast fogs are of rare occurrence, because the Alaska current turns at Conception Point somewhat away from the land.

The meridian of 122° (?) is considered to be the limit of the lands which receive a rainfall of about 20 inches, and may be cultivated without artificial irrigation. In the great valley the rainfall at the southern end is very small : only 4 to 6 inches at Bakersfield, it increases to 20 inches near Sacramento, and attains 27 inches at the northern end of the valley, while in Northern California, particularly near Mt. Shasta, 78 inches or more are recorded. In the Sierra Nevada the rainfall increases with the height at the rate of about one inch per 100 feet, but up to an elevation of 2300 feet the cultivation is of much the same character as in the valley. Higher up and extending to an altitude of 4600 feet there is a profusion of fruit—grapes, peaches, pears, and apples of very fine flavour. The upper slopes yield timber and pasture for sheep, and here the mining industry is carried on. It has, however, of late given way before the advance of cultivation, and the mining districts are fast becoming depopulated. The valleys of the Coast Range, the Santa Clara and Salinas, for instance, are densely peopled, and produce fruit and wine ; the valleys of the Napa and the Sonoma also, where lava crops out among the slates and sandstones, are noted for their wines. In several places quicksilver, bitumen, and petroleum are found, as well as good lignite. Dairy-farming is also successfully prosecuted. Salt, as in all lands where the rain is insufficient to properly wash the soil, collects in the great valley, and is a great obstacle to agriculture. The soil, indeed, is rich, containing in many parts as much as 20 per cent. of nitrate of soda and potash. Were it, then, possible to neutralise the injurious effect of the salt, many large tracts, which are now clothed only by a thin covering of grass, would yield abundant crops. Much has been done in the case of carbonate of soda by manuring with gypsum, which combines with the soda to form harmless Glauber's salt. Much of the land in the Californian Valley, on the coast, and in Southern California, though not excessively salt, is insufficiently watered. In the spring it is covered with flowers of the most beautiful colours, one of the most conspicuous being the bright orange Californian *Escholtzia* ; but in April the blossoms disappear, and nothing is seen but the whitish or woolly leaves of the flora of arid regions. The effect of irrigation on such lands is marvellous. The plain of Fresno has by this means been converted into most fruitful garden-ground, where grapes, oranges, figs, etc., are grown ; and the same wonderful alteration has been brought

about in Southern California, some of the water, moreover, feeding the orange trees with potash which it holds in solution. Some of the water is obtained from Artesian wells, which have been as successful here as in North Africa.

Vine-growing is a very important industry, and the wines will without doubt be much in demand when their preparation is better understood, for the various kinds of European grapes retain their peculiar properties when planted in suitable situations. Californian prunes have almost driven those of France out of the American market. Apricots and figs are grown of excellent quality, and the oranges leave nothing to be desired. Among the other objects of cultivation are olives, beetroot, dates, and hops.

Nicaragua.—In December 1891 Dr. Bruno Mierisch received a commission from the Nicaraguan Government to make a geological examination of the east coast of that country, with especial reference to the gold deposits, of which most conflicting accounts had been received. The cultivated western part of the State is shut off from the east coast by a broad tract of uninhabited forest, and therefore in travelling from Nicaragua Dr. Mierisch was obliged to make a détour, descending the Rio San Juan, and availing himself of the steamer *Curaçao*, which plies along the Rio San Juan del Norte.

Prinzapolca is the name of the most important river of this region and of a Department, but the name is also frequently used to denote the whole country between the Rio Grande and Rio Coco, as far inland as 85° W. long. It is a large plain rising very gradually from the coast towards the interior. Near the sea mangrove swamps cover large areas, and are intersected by a network of creeks, with here and there lagoons of brackish water, one of which, the Vounta lagoon, has an area of about 20 square miles. The land rises by very slow degrees towards the interior, and even where rapids occur on the rivers they are caused, not by imposing cliffs but by low horizontal rocks. Throughout Prinzapolca the same level country is met with, and where mountains do occur, as at the Quiana and Vocala rapids on the Prinzapolca river, they rise immediately from the plain, and beyond them the country re-assumes its former character. The mountains are not reached till the sources of the streams are approached, which lie in ranges radiating from the highlands of Pis-Pis, where a mean elevation of 1600 feet is attained. Dr. Mierisch was able to observe this configuration from the Salai, an isolated basaltic cone 6500 to 8000 feet high. The Hiya, to the west of the Salai, which sheds its waters into the river of the same name, a tributary of the Rio Grande, is equally large; and another lofty isolated mass lies to the north-north-east, near the Rio Coco. In its lower course the Prinzapolca sends out three branches, of which the first leaves the main stream above the mouth of the Banbana, and loses itself in swamps; the second, on the northern side, is called the Valpasicsa, and is closed for vessels by a bar three to four feet deep. The main branch divides again into a multitude of channels. Up to Yoya the river is navigable by boats drawing nine to ten feet of water; but here are rapids that in the dry season cannot be passed by the lightest of river steamers; while at Tungla, and, above all, at Quiana and Vocala, the passage is not only difficult but dangerous for canoes. Boats do, however, ascend to Cucuina, a town of three hundred inhabitants, the market for all products consumed in the mining districts or exported from them. The Banbana is the most important of the affluents of the Prinzapolca. It is about 100 yards broad at the mouth, and is not much inferior in size to the main river. It may be navigated, though with difficulty, to the neighbourhood of Pis-Pis. The Cuculaia, which in general flows from north-west to south-east, is navigable up to the rapids of Unqui, and is a far better channel than the Prinza-

polca, since it is not broader than 30 yards on an average, and consequently deep. All the streams of this country are subject to sudden rises of level, when the water spreads far and wide over the land, sweeping away houses, plantations, forest, and even the tough bamboo, and leaving behind a rich deposit of mud which is quickly covered with juicy grass.

It has been supposed that the eastern half of Nicaragua is covered by one mighty forest. Such is not the case, for a considerable area, especially near the coast, is savannah. Here the characteristic forms of vegetation are varieties of palms and a fir very rich in resin. It is strange to a European to see this tree, usually associated with the severe climate of the north, flourishing in tropical marshes only a few miles distant from the coast and barely 30 feet above sea-level. The greater part of Prinzipolca is, indeed, covered by primeval forest, in the shade of which many plants spring up under the influence of a warm and damp climate. Cocoa of good quality grows wild, and fine trunks of valuable timber—cedar, mahogany, etc.—are to be found at some distance from the rivers, for those easily procurable have been cut down already. Indiarubber is the most important natural product, but the export has diminished, for the Indians draw off too much sap from the trees at one time, or cut them down altogether. Dye-woods and trees containing odorous resins, or of medicinal value, await the arrival of men who know how to turn them to account. As the flora, so also the fauna comprises numerous species. Alligators, well-flavoured fish, and turtle inhabit the streams: the puma and jaguar range the bamboo thickets; and wild pigs, the principal animal food of the Indians, are found in large herds. The tapir and various kinds of deer are not uncommon; and the leguan, that loves to sun itself on the boughs overhanging the rivers, is hunted by the Indians, who prize its flesh and eggs. The wild turkey and several kinds of fowl are particularly numerous in the hilly country. Insects, such as mosquitos, spiders, ants, etc., make a journey through the woods very disagreeable; and of snakes there are the poisonous *Tokobá* and a harmless boa-constrictor.

The natives belong to two tribes: the Mosquito Indians on the coast—tall, well-built people, with intelligent expression of countenance; and the Sumu Indians of the interior—short squat figures, with broad faces and stumpy noses. They speak different dialects, but not so dissimilar as to prevent them understanding one another. Only a few thousands now remain of what must have been a considerable population, to judge from the stone weapons and utensils scattered over the country and the abandoned plantations. The Mosquito Indians, especially near the coast, are subservient to the immigrant Negroes from Jamaica, and, in their turn, lord it over the Sumus, treating them almost as slaves. Some of the latter are stationary, while others wander up and down the rivers. They live chiefly by fishing and the chase, using to catch fish bows and arrows and barbed harpoons as well as lines: the settled Indians have also small gardens of bananas, yams, sweet potatoes, etc. Those dwelling near the coast, and the younger generation everywhere, have adopted European clothing; but the older men and the women wear a cloth of bast, and the latter adorn themselves with strings of beads: tattooing is also in vogue. Polygamy prevails and, as usual among uncivilised races, most of the work falls on the women.

The swampy lands are formed of alluvium. Twenty miles or so from the coast begin sands and clays of Tertiary age, often intersected by dykes of eruptive rocks, particularly andesite. The mountains Salai and Hiya are formed of a plagioclase basalt, and cones of basaltic tuff are found in the neighbourhood. Up the Prinzapolca to a short distance above Cucuina are found rocks which Dr. Mierisch refers to the Trias, as they possess all the characteristics of the New Red

Sandstone in the east of the United States. Above the point referred to occurs limestone containing quartz, orthoclase and mica, and clay slates. These may be of Devonian or even Silurian or Cambrian age ; probably they belong to more than one period. They are tilted at a large angle—seldom less than 80°—through the intrusion of eruptive rocks, chiefly diabase and diorite. Of the gold that is found in the quartz veins in the diabase, Dr. Mierisch deals at some length. The reports as to the wealth of the deposits were much exaggerated ; but the gold, by attracting immigrants, will probably be beneficial to the country, which has a rich soil, and would repay the cultivator.—*Petermann's Mitt.*, Bd. 39, No. 2.

AUSTRALASIA.

Rainfall in Queensland.—Mr. Clement L. Wragge, Government Meteorologist, a Corr. Member of this Society, has kindly communicated the following particulars of a remarkable rainfall at Crohamhurst, situated on the western slope of Mt. Blanc, a peak on the spur of the D'Aguilar Range, which is an offset from the Blackhall Ranges :—

"The whole of this district is watered by the Stanley River, a tributary of the Brisbane River, and hence the values given below were prominent factors in producing the terrible floods from which we have suffered. I may mention that the observer at Crohamhurst is Mr. Inigo Owen Jones, one of my specially trained assistants, and that implicit reliance can be placed on his figures."

"The following are the more phenomenal falls at Crohamhurst for the flood period :—For 24 hours ending 9 a.m., Feb. 1st, 10·775 in. ; ditto, Feb. 2nd, 20·056 in. ; ditto, Feb. 3rd, 35·714 in. ; ditto, Feb. 4th, 10·760 in. The gauge is a standard of the 'eight-inch' pattern, standing one foot above the ground, at an altitude of about 1400 feet above mean sea-level. The approximate latitude and longitude of Crohamhurst are 26° 50′ S. and 152° 55′ E. respectively. During the heaviest falls the gauge was emptied every three hours, night and day. I think that meteorologists will agree that, for a twenty-four hours' fall, we have beaten the world's record."

The Southern Alps of New Zealand.—Mr. Malcolm Ross and other members of the recently formed New Zealand Alpine Club have accomplished some good work among the glaciers of Mt. Cook. Their original intention was to attempt to reach the summit, but it was abandoned owing to unsettled weather and the indisposition of one of the party. On Jan. 2nd they started from the Hermitage and established a bivouac at the foot of Mount de la Bêche, about 12 miles up the Tasman glacier. On the following Saturday they ascended the mountain to a height of 9600 feet, where they found further progress impossible. The view from this point was magnificent, taking in the island from coast to coast. All the party suffered severely from sunburn, for the heat at midday was so intense that the rocks could not be grasped for any length of time. Mt. Cook is becoming a favourite summer resort, and last year the Bell Glacier pass was crossed by several tourists. —*The Colonies and India*, April 8th.

GENERAL.

Drift-ice in Southern Latitudes.—In the *Annalen der Hydrographie*, Heft 2, Herr L. E. Dinklage has collected notices from ships' logs of the extensive drift which was first observed early in April of last year by vessels sailing round Cape Horn. From reports dating from the end of October, it appears that the mass of ice had scarcely diminished during the seven intervening months. Nor had it changed its position to any great extent ; on the whole, its movement had

been towards the north-west, but under the influence of variable winds and currents it sometimes retrograded, and in the latter months appears to have retreated a little to the south. The main body of the ice was in April at about 45° S. lat. and 35° W. long, and in October it lay in lat. 43° and long. 31° W. In the meantime the drift-ice spread itself out more and more to the north, and, more particularly, north-westwards. The most northerly positions in which it was observed by vessels were 38° S. lat. and 36° W. long. (on Sept. 15), 37·6° S. lat. and 31·5° W. long. (on Aug. 7), and 37° S. lat. and 27° W. long (on Aug. 8th)—several degrees beyond the usual northern limit. In spite of its wide extent, the ice was very close in the latter months. It is certainly astonishing that this ice should last so long a time in such low latitudes. This fact is partly accounted for by the immense mass of the icebergs. Passing over estimates which may be exaggerated, we learn from actual measurements that bergs over 320 feet high were not uncommon. Including the submerged part, such bergs must have had a total depth of 2300 to 2600 feet. On August 4th, Captain J. Breckwoldt, of the *Mariana*, saw several islands of ice, the height of which he estimated at 650 feet, and length at eight to ten nautical miles. These masses must have had a volume many times that of Helgoland.

It is scarcely possible that these ice masses can have borne the warmth of the southern summer. Between 40° and 44° S. lat. they would float in water having a mean surface temperature of 57° F. According to the last reports in October, the bergs were already begining to show signs of disintegration. Large masses of ice were still found in higher latitudes, so that the movement from the south was evidently still going on. From still later reports (*Annalen*, Heft 4), it seems that this ice had moved at the end of December out of the Cape Horn route, for it was encountered by the *Eivion* on the route from the Rio de la Plata to Australia. Further southwards, however, a fresh movement from the south-east is announced, the chief masses of ice lying in the middle of January between 51° and 48° S. lat. and to the east of 47·5° W. long. The enormous size of the bergs gives reason to expect that they will not quickly disappear, and hence vessels will run considerable danger in these waters.

The Production of Gold.—From a table in the *Revue Fr. et Exploration*, April 1st, it appears that the total production of gold in the world rose in 1891 to 6,033,000 ounces. In 1890 there was a small decrease in the output, but in the following year the development of the placers at Witwatersrand brought up the amount nearly to the figures of 1889. In 1888 the Transvaal yielded only 4½ per cent. of the total weight, but in 1891 it produced 836,250 ounces, or 13·8 of the total, while the production in 1892 is estimated at 1,250,000 ounces, or 21 per cent. In 1890 the yield in the United States was about 1,586,500 ounces; in Australia, 1,469,200; and in Russia, 1,019,000.

MISCELLANEOUS.

Sir John Willoughby is excavating among the ruins of **Zimbabwe**, and has discovered many interesting relics.

On May 10th the **Imperial Institute** was opened by Her Majesty the Queen. The objects and mode of working of the new institution have been fully set forth in the *S.G.M.*, vol. viii. p. 431.

M. José M. Pando has collected a party at Puno on the Rio Beni for the purpose of exploring the unknown reaches of the **Madre de Dios** and its tributary, the Inambari.—*Comptes Rendus*, Nos. 6 and 7.

Mr. David Lindsay, the leader of Sir Thomas Elder's late expedition to Central Australia, left Adelaide on April 11th for Port Augusta to join an expedition into the unexplored districts of North-Western Australia.—*The Colonies and India*, April 15th.

A charter has been granted to a company for the construction of a railway from **Quilimane to Shamo**, which will tap the waterways of the rivers Zambesi and Shiré, and will greatly enhance the value of Quilimane as a port for commerce with the interior.—*South Africa*, April 5th.

The Canadian Government has made a provisional arrangement for one year with Messrs. Huddart, Parker, and Co., of Sydney, for a monthly service of steamers between **British Columbia and Australia**. It is expected that this service will lead to a great development of inter-colonial trade.—*The Canadian Gazette*, April 13th.

A valuable manuscript has been discovered in the palace of Tsarkoe Selo, near St. Petersburg. It is a narrative of the voyage of the **last Bering Expedition** by Savelo Laurenzievitch Vaxel, who, after the death of Bering in December 1741, succeeded to the command. It contains some interesting water-colour sketches representing Arctic animals that are now quite extinct, such as Steller's sea-cow (*Rhytina gigas*).—*Boll. della Soc. Geogr. Italiana*, Feb. 1893.

NEW BOOKS.

Wild Spain (España Agreste): Records of Sport with Rifle, Rod, and Gun; Natural History and Exploration. By Abel Chapman, F.Z.S., Author of *Bird-Life of the Borders*, and Walter J. Buck, C.M.Z.S., of Jerez. With 174 Illustrations, mostly by the Authors. London: Gurney and Jackson, 1893. Pp. xx. + 472. *Price* £1, 1*s*.

A love of wild sport is not always combined with a scientific interest in wild life, but Messrs. Chapman and Buck are zoologists as well as sportsmen. During more than twenty years they have used their eyes and guns in Spain—with much delight, no doubt, to themselves, and with results which are certainly pleasant to us. In pursuit of their twofold object—sport and science—the authors have spared, they tell us, neither time nor trouble, "spending weeks—sometimes months—at a time in the sierras and wildernesses, bivouacking wherever night overtook them, or the chances of sport might dictate, and camping out on the glorious snow-clad cordilleras." Many books have been written on Spain, but this is the first which has been devoted to a record of the sport and wild life of the country. We congratulate the authors, for they have done for Spain what Charles St. John did for our own Highlands.

The authors begin with some notes on the variety which characterises Iberia—variety of scenery, of climate, and of people, and they give a more detailed picture of that "old-world corner of Europe" which is known as Andalucia. A boar-hunt in the sierras; big days with the grand bustards; the history of the fighting bull, and an unprejudiced appreciation of the *Fiesta de Toros*; the abundant bird-life of the otherwise dreary *marismas*; the natural history of the ibex, which to shoot is the dream of the big-game sportsman; experiences with eagles; bird-life among the pines, on the plains and prairies, by lake and lagoon; the home of the lämmergeier; wild-fowling in the wilderness, deer-driving in the forests; agriculture—or what stands for it; brigandage and gypsies,—these are the subjects of some of the

chapters. It is difficult to select any facts of special interest, the whole book is so interesting; but many will be glad to have full information in regard to the herd of wild camels discovered roaming at large in the Andalusian *marismas*, and in regard to the flamingoes which sit on their flat nests, not astride, but with their legs doubled under them.

Messrs. Chapman and Buck have written with a wealth of experience behind them, with the briskness and directness that one would expect from sportsmen, and with the precision of men of science. Some of the stories incidentally told are very beautiful; that on page 172 is a poem. The book should find many readers, and even those who care not either for Spain or for sport, either for birds or for beasts, will find here—and it is more than they deserve—some things to make them laugh or cry. The printing and graphic illustrations are further excellencies of this volume, though for some of the sketches the excuse in the preface seems necessary.

In an Enchanted Island; or, A Winter's Retreat in Cyprus. By W. H. Mallock. Third edition. London: Richard Bentley and Son, 1892. Pp. 407. *Price* 6*s.*

Mr. Mallock, in his opening chapter, defines "the true traveller" as one who "seeks precisely what the excursionist dreads," and who "moves in a world of sights and sounds and associations undreamed-of by the tourists who flourish at *tables-d'hôte*." To the true traveller "each ruined marble temple, each desolate baronial banquet-hall, is a shell which murmurs with a fragment of the illimitable music" of human destiny.

Arriving at the port of Larnaca in the winter of 1887-8, Mr. Mallock was hailed by a man who spoke English tolerably well, and who was called "Scotty" because he had once been in Glasgow. He was an Arab from Syria who "knew Cyprus thoroughly from end to end," and Mr. Mallock engaged him as servant during his stay. With Scotty he drove to Nicosia, "the immemorial seat of government," and there he lodged with English friends, who assisted him in acquiring a knowledge of the place and its people. He reminds us that once the "English Crusaders came in their grey armour" and seized Nicosia.

Cyprus, which became a British possession in 1878, was conquered by the English Crusaders under Richard Cœur de Lion in 1191. Richard was married there (at Limasol) to the Princess Berengaria. He afterwards sold the island to Guy de Lusignan, ex-King of Jerusalem, for a sum about equal to £200,000. The dynasty of this Guy de Lusignan, a "penniless, well-born adventurer," flourished in Cyprus for 300 years. "Of all dynasties known to European history, the career and the position of this is incomparably the most romantic." Its counts and barons of French and English ancestry settled in Cyprus and kept their feudal state amongst spice-gardens and silken luxury. Gothic churches rose with windows of elaborate tracery. Castles crowned the mountain-tops. The streets of Nicosia in the 14th century were alive with gorgeous retinues—with ladies on horses whose housings glanced with jewels, and knights in velvet bonnets and mantles clasped with gold. Gay and gallant parties daily rode out hawking: and the chase of the wild-boar took place amid forests where Adonis died, and where still gleamed the milk-white columns of many a deserted pagan temple.

After seeing the "tourist's sights of Nicosia"—the Konak (or Turkish Government Office), the ramparts, the bazaar, and the Cathedral—Mr. Mallock went in quest of the famous green marble of Cyprus, so much prized by the ancients. He found only a small patch; but he noted the astonishing depth of soil over a large part of the island, on which forests would rise again "if it were not for the

peasants, who cut every stick for firewood, and the ubiquitous goats, who allow few sticks to grow." Fortunately, the British Government has now placed certain tracts of land under the protection of foresters, and these tracts will not only become beautifully wooded, but will increase the rainfall and immensely benefit the island. "Cyprus, in fact, is really a sleeping Eden, needing only the gift of seasonable rains to awaken it."

The town and castle of Kyrenia, the mountain castle of St. Hilarion, and the mediæval monastery of Bella Pais, were also visited by the author. Occasionally he plunged into dungeons: "and yet," he exclaims, "when I rose again to the brilliance of the blue Cyprian sky and saw around me the silvery Cyprian mountains, and near me the bloom of the sea from whose foam Aphrodite rose, the charm of dreamland fell over everything; and I said to the passing moment again, 'Stay, thou art so fair.'"

Mr. Mallock also went to Famagusta, and saw in its castle a tower still called *Torre del Moro*, "from having once been the lodging of one of the Venetian generals, Christofero Moro, the original of the Othello of Shakespeare; and it was to this castle, if anywhere, that Othello must have brought Desdemona."

The book is not only written in an exquisite literary style, but the author himself fascinates us with his enthusiasm, erudition, and good humour. It ought to lead many British travellers to visit their new and little-known possession. A map of Cyprus and an index would complete this charming volume.

From Sultan to Sultan. Adventures among the Masai and other Tribes of East Africa. By M. French-Sheldon. London: Saxon and Co., 1892.

There is an air of distinction about Mrs. French-Sheldon's volume. It is well printed in large type on good paper, and has a wealth of illustration, chiefly from her own photographs, such as has seldom, if ever, appeared before in a book of African travel. The illustrations, however, are placed so promiscuously throughout the text, and are so seldom in touch with it, that a feeling of irritation constantly arises in the curious reader who wishes some description of the engravings. But this is a minor matter, and the reader is glad to have them even apart from the context.

It is seldom we have a volume of African travel from a lady, and it would be a mistake to take this as a book of original exploration, such as was undertaken by Miss Tinné; it is rather an account of the trip of the adventurous *fin-de-siècle* tourist tired of the beaten tracks of civilisation, but as such it is eminently successful. The story is nothing if not dramatic, and Mrs. French-Sheldon's personality figures largely everywhere. She makes a royal progress as the "White Queen" who honours her visitants and refuses to pay *hongo*. The illustrations depict her occasionally in a travelling costume *à la* Stanley; but for State purposes in court dress covered with ornament, and carrying a sword with jewelled baldrick. The Stars-and-Stripes are carried afloat on Lake Chala; her alpenstock is bannered with the motto "Noli me tangere," and "French-Sheldon rings," specially made for the purpose, are everywhere left as mementoes of her visits.

Mrs. French-Sheldon had grave difficulties in starting. Yet she was not without much assistance and encouragement. The British India Company detained their steamer a whole day for her palanquin. Dr. Parke gave her medical advice, Captain Stairs most practical rules for her journey; and even the passive and kindly-meant resistance of Mr. George Mackenzie and the officers of the Imperial British East Africa Company turned into hospitality and subsequent co-operation. After leaving Zanzibar, where she visited the Sultan's zenana, which is graphically

described, Mrs. French-Sheldon started from Mombasa, and visited the Giriama country, the southern and eastern slopes of Kilima-njaro, circumnavigated the crater-lake Chala, crossed over into the German territory, and returned to the coast at Pangani.

Throughout the narrative of her journey we have vivid details, full of interest, such as only a lady could have written. These picturesque touches of Anglo-African pioneer life should be read by friends at home. We learn the details of African housekeeping, how the pioneer spends his time, how he furnishes and adorns his hut, the disappointments of his life, and the ability, steadfastness, patience, and self-abnegation with which nevertheless he does his work. We learn how the caravan is arranged, how started, how the men are dressed, how they speak, how they call revolvers "baby guns," and homely touches at every point that bring the whole life vividly to the imagination.

One of the traveller's aims was to mingle much with native women and children; and with that view she attempted, though unsuccessfully, to obtain female interpreters from the missions at Mombasa. Throughout her journey she took every opportunity of cultivating the friendship and learning the ways of the people. The chapters on Taveta, describing the manners and customs of the Wa-Taveta from a woman's point of view, are most interesting, and should be carefully read.

Mrs. Sheldon's greatest geographical feat was the descent to and circumnavigation of Lake Chala, the crater-lake to the south-east of Kilima-njaro. This lake was originally discovered by the late Rev. Mr. New, in 1871. The missionary descended to the water's edge, and brought home a bottle of the water for analysis; but it is so difficult of access that, when Mr. Joseph Thomson visited the district a few years later, there was no practicable pathway. He thus describes the place: "I went all around it: and although I am not deficient in enterprise or nerve, I saw no place that I dared descend, not even if I could have swung from creeper to creeper like a monkey." But Mrs. Sheldon, accompanied by Mr. Anstruther, the local officer of the Imperial British East Africa Company, not only managed to descend but to take down two sections of a copper pontoon, which they fitted up as a boat, and on which they paddled round the lake, flying the Stars-and-Stripes.

The "White Queen" had a great influence over her people, yet she found it necessary occasionally to use the *kibosh*; but she claims that the number of floggings did not exceed ten. One of her people fell ill with delirious fever, but he was not left behind; he was carried four-fifths of the journey, although it required the service of eighteen of her porters to do it. During the whole of her journey she only lost one of her followers by death. He had loitered while looking for water, fallen into a gully, and been eaten by lions.

Mrs. Sheldon has her own notions of missions and education, which are well worth reading, particularly her remarks on the sending out of eminently unsuitable clothing by philanthropists at home, which the missionary deplores but fears to check. Like nearly all African travellers, she is an advocate for the railway to the interior: "no immunity for the natives from slavery until the railroad is constructed."

Mrs. Sheldon does not like the Germans or their manner of civilising; she vastly prefers the British. "Throughout the German occupation of East Africa, on all sides there is a tooting of horns, the rattling of guns, the salute of cannons—all that belongs to the display and announcement of military despotism and rule: whereas the English have no army, no naval force backing them to hold their sway over the natives in their occupation of East Africa; and it is but a question of time when the natives will voluntarily yield a willing homage and fealty to the English Government, which the Germans aim to procure, and only exact by great stringency

of measures." Her indignation against Dr. Peters is intense. He "provokes by coercive measures the native in his own land, and develops all of the worst propensities latent in his nature;" his "methods are simply brutal, atrocious, and unnecessary."

Mrs. Sheldon had bad luck in German territory and a melancholy ending to her tour. When she was half-way back to the coast, weary and worn, the bearers who carried her rattan palanquin slipped in crossing a temporary bridge, and dropped her into the ravine below. The traveller was so injured that she had thenceforward to be always carried as an invalid. Even on board ship misfortune pursued her, for on deck a sudden gust of the monsoon overturned the mattress on which she was lying and dashed her against the ship's railing, fracturing her skull; yet, in spite of all, she recovered and joined her family at Naples in safety.

We have one word of advice if a second edition is contemplated: most of the drawings are from photographs and faithful to nature, but that on page 312 can only be from description, aggravated by emotion. The python there depicted, which winds its folds round Mrs. Sheldon's palanquin, is startling enough to provoke a smile of incredulity, and cannot, as drawn, be less than thirty feet in length, while the text informs us it was "about fifteen feet long." In a new edition the python might be altered to correspond better with the text.

Rulers of India: The Marquess of Hastings, K.G. By Major Ross-of-Bladensburg, C.B., Coldstream Guards. Oxford: At the Clarendon Press, 1893. Pp. 296. *Price* 2*s.* 6*d.*

Lord Moira (afterwards Marquess of Hastings) became Governor-General of India in 1813, and held office until the beginning of 1823. At the time of his appointment our affairs were in a very critical position. When Lord Wellesley was recalled in 1805, and his bold policy was upset by orders from England, the arrangements then agreed to left the most turbulent and ambitious of the native States with full liberty to indulge their predatory disposition, while the English Government, debarred from interfering, could only look tamely on and allow weaker States, which had trusted to them, to be harried and crushed. During the administration of Lord Minto the natural results of these unwise and timid proceedings gradually manifested themselves, and in 1813 the evil had reached such a height as not only to tarnish our good name but to threaten the maintenance of our power in India. Pindari and Pathan *condottieri* and freebooters annually burst forth from Central India on foraging raids, which spared British territories as little as native States. The Mahratta chiefs had been emboldened to believe that they could, if combined, drive the English out of India, and were preparing to make the attempt. On the north the Gurkhas, flushed with their success in the Himalayan region, were attempting to extend their dominion in the plains; and at the same time the British Government was hampered by grave financial difficulties. Lord Moira had, as member of Parliament, been opposed to Wellesley's policy, and he certainly went out to India with no intention of reverting to what he had condemned. But when once he was there and had studied and grasped the situation, his vigorous understanding led him to see what was the only possible remedy for the intolerable evils from which the country was suffering. There must, as Wellesley had clearly perceived, be some paramount power able to enforce general order, and the organised bands of freebooters must be stamped out. With what vigour, judgment, and skill his measures were planned and executed, and with what triumphant success, due in a large measure to his own personal supervision, they were carried out, has been admirably well told in this monograph. The narrative

of the military operations is clear and animated ; the selections from Lord Hastings' own papers contain a terse and excellent explanation and defence of his action, and reveal the statesmanlike spirit that guided him in all his proceedings. The policy of reconstruction and of peaceful administration after victory was won is well described in brief but interesting chapters. The book is in every way worthy of the series to which it belongs, and of the man who at last completed the enterprise begun by Clive, prosecuted by Warren Hastings, fully conceived and partially executed by Wellesley, and who definitely made the British power to be paramount in India.

A Study in Municipal Government: The Corporation of Berlin. By James Pollard, C.A. Edinburgh: William Blackwood and Sons, 1893. Pp. 164.

The author has long been a member of the Corporation of Edinburgh, and is Convener of its Public Health Committee. He visited Berlin in 1892, and subjected its municipal institutions to a searching examination, the result of which will be found in this excellent book. The rise of Berlin has been marvellously rapid, for, whilst its population at the beginning of the century was only 172,000, it is now 1,635,000. "Berlin," says Mr. Pollard, "has become the greatest manufacturing and industrial centre on the Continent. . . . No city in the eastern hemisphere has within so short a period shown such a wonderful expansion ; it is only among the cities of the New World that a parallel can be found." The Corporation of Berlin is presided over by a Chief Mayor and a Mayor, who are both elected by the Town Council, but whose election is subject to the approval of the Emperor as King of Prussia. Thirty magistrates are also chosen by the Town Council, but each magistrate must be approved by the Chief President (or Civil Governor) of the province of Brandenburg. The Town Council consists of 126 members elected from the various districts of Berlin by manhood suffrage. The salaries of the leading officials are: Chief Mayor, £1500 ; Mayor, £900 ; and 15 magistrates, who give their whole time to the service of the city, are paid from £350 to £750 each. Mr. Pollard passes in review the public management in Berlin of water and gas, sanitation, hospitals, relief of the poor, education, police, free library, fire brigade, etc., and arrives at the conclusion that, in many respects, this country has much to learn. Certainly from the thoroughly practical, thrifty, and industrious character borne by Germans, one would infer that much good must accrue to our British municipal institutions by a few hints being taken from Mr. Pollard's book. For example, among other startling revelations made by him of the success of German municipal management, is this: "Those who know something of the squalor and misery prevailing in the slums of London, Liverpool, Glasgow, and in the lower quarters of our 'own romantic town,'" will be surprised to learn that "*there are no slums in Berlin.* . . . For the past twenty years the Corporation have waged constant and successful war against dirt and material pollution among people and dwellings in any form in which these evils menace the general health of the community." At the same time, we must remember, in the first place, that at Rummelsburg the Berlin Corporation has large sewage estates, where police offenders and paupers are sent to work, instead of being allowed, as in Britain, to go at large after enduring short terms of imprisonment. We ought also to recollect that in Prussia owners of property "hold it subject to the right of the State or the municipality to take it compulsorily on due compensation, for any purpose affecting public interest." No *solatium* over and above the full value is paid, and the vast expense and delay of obtaining, as we have to do, private bills in Parliament are also obviated. "This," concludes Mr. Pollard, "is not the least important lesson which we at home may learn from the municipality of Berlin."

One very interesting feature in this volume is Mr. Pollard's comparison of the municipal institutions of Edinburgh with those of Berlin. Thus, he tells us that the ratepayers of both cities pay about equally for ordinary municipal purposes. Again, whilst the water supply of Berlin is per head one-half that of Edinburgh, the annual profit made by the Berlin Corporation is 34 per cent. of the total revenue, whereas in Edinburgh a surplus of not quite 3 per cent. is obtained. The proportion spent by Berlin upon public charity, including poor-rates and hospitals, is only one-third that of Edinburgh, yet no town could show better value for its money than Berlin. Fourteen per cent. of the population of Berlin are at school, or 2 per cent. more than in Edinburgh. A less proportional sum is expended in Berlin than in Edinburgh upon parks and gardens. Finally, "glaring advertisements and offensive sky signs" are contrary to the police regulations.

The Land of Ararat; or, Up the Roof of the World. By A Special Correspondent. London and Sydney: Eden, Remington, and Co., 1893. Pp. 348. *Price* 6*s.*

The mission of the Special Correspondent, from internal evidence a Scot, was not geographical but rather political. He was to sift the truth of the many alleged instances of persecution by the Turks, and of brutalities committed by the Kurds against the Armenians. On making inquiries on the spot, he found that these stories of outrage, put in circulation in Europe by Armenians living in France and England, had been greatly exaggerated, though they contained sometimes a kernel of truth. But many Armenians complained to him of the cruel way in which their fellow-countrymen in Europe incited them to open rebellion against Turkey, which very naturally led to Armenia being placed in a state of siege. They want justice and personal protection, but not to overthrow the authority of the Porte. To look at, the Kurds are truculent, insolent, and aggressive; but when in the field under Mukhtar Pasha, they were deficient in courage and showed the white feather. At one village the author met an Armenian who on one occasion had had the pluck to resist the extortion of some Kurds, and had never been molested since. But the Kurds themselves suffer at the hands of the local authorities, and one of them declared there were seven hundred others in his district who would go over to the English if they would only come and govern the country. When their religious ardour is excited, the Armenians are quite ready to maltreat and persecute a weak opponent. In proof of this, an amusing anecdote is related of a mob of fanatical Armenians which some years ago was wrecking the houses and imperilling the lives of their Protestant fellow-countrymen at Ardashir, when they were suddenly attacked and put to flight by a crowd of Mussulman women armed with long poles. The women did not see why the Giaours should assail the Protestants because they did not worship pictures and images. The idea of an autonomous Armenia is shewn to be an impossible dream. The ancient kingdom, like that of Poland, is partitioned between three Powers, no one of which would abandon its share without a severe struggle; and as to autonomy confined to the portion under Turkish rule, it is not at all certain that the Armenians form the majority of the present population. An educated Armenian told the author that his countrymen were quite unfitted for Home Rule, from their overweening personal ambition, which would impel every man to intrigue till he had a share in the government. Though the author met Turks in authority who deplored the state of affairs in Armenia, he is bound to say that the Porte has not done nearly enough in the way of reform. The people are subject to unjust exactions from tax-gatherers; the Kurds are not sufficiently kept under control, and are allowed to remain armed. Corruption of

justice is everywhere rampant; and this applies to Mussulmans and Christians alike, for both take bribes when administering justice.

The author never left the beaten track. Starting from Trebizond, he followed the post road to Erzerum, Kars, and Akstafa, where he took the railway to Tiflis and Batum. He made the journey in mid-winter, and had to perform the greater part of it in sleighs. The cold was enough to lessen the pleasure of the trip, and his experiences, which are pleasantly told, are enough to dissuade a tourist from attempting this route when snow is on the ground.

The Rise of the British Dominion in India. By Sir Alfred Lyall, K.C.B., D.C.L. London: John Murray, 1893. Pp. xvi + 288. *Price* 4*s.* 6*d.*

This, which is one of the University Extension Manuals edited by Professor Knight, is not a general history, nor does it supersede more detailed chronicles and narratives of events. It assumes, and almost requires, some acquaintance with these, but is itself rather an invaluable commentary on more detailed histories, its object being to give not merely the bare facts, but the philosophical interpretation of them, and so to account for the growth of the English dominion in India. With a firm grasp of the thread of connection running through the whole series of events, the author brings clearly into view what the aims of the English merchants and Government originally were; shows how with changing circumstances these naturally and necessarily expanded and were transformed; and analyses and explains the causes of the great success with which they were crowned. Sir Alfred starts from the position, for which he strongly contends, that it is really a superficial, though common, view which regards the development of our Indian Empire as a marvellous phenomenon quite unforeseen and almost inexplicable; he maintains, on the contrary, that our success can be naturally explained, was due not to chance but to definite causes which can be shown to account for the results, and could have been to a large degree predicted. His work is the expansion of this thought, and few of those who peruse it will, we think, fail to admit that he has proved his case with a cogency of demonstration which there is no gainsaying. With keen and penetrating insight he has searched out the determining factors from among the mass of unimportant data, has so grouped and arranged them as to show their bearing on the main issue, and has given admirably luminous and convincing expositions of the internal conditions in India which favoured the growth of the English power, and of the circumstances which at each of the decisive moments and stages of her advance gave England an advantage over her European rivals. But more notable even than this thoughtful and masterly survey of the causes and influences which co-operated to produce the great result, is the abundant evidence that he has felt that he is handling one of the greatest historical dramas. He has told the successive acts of this drama not as a cold, uninterested observer, but as one whose imagination has been impressed, who is inspired with enthusiasm by the greatness of his theme, and who can conclude by affirming that "whatever may be the ultimate destiny of our Indian Empire, we shall have conferred upon the Indians great and permanent benefits, and shall have left a good name for ourselves in history."

Seventy Years of Life in the Victorian Era: embracing a Travelling Record in Australia, New Zealand, and America, etc. By A Physician. London: T. Fisher Unwin, 1893. Pp. 283. *Price* 5*s.*

In a chatty, not to say garrulous, manner our old physician records his experiences during a long and frequently stirring career. The chief value of his

book will be found in the contrast that he incidentally draws between the facilities afforded to travellers now and in the past. If, in remarks on matters not strictly connected with his voyages and excursions, he frequently airs his numerous crotchets, they are never in bad taste, and such digressions need not be considered faults; but the tendency to preach might have been restrained with advantage. The history of the campaign in the Crimea will probably be read with most interest, as the subject is treated of from a point of view seldom brought before the general reader; and the story told of the work done by surgeons and nurses, and the hardships undergone by them and by the sick and wounded, is of considerable value. We have also perused the account of the author's career at the university with interest and sympathy, his struggles in pursuit of knowledge and his final triumphs being modestly and feelingly related. For the rest, we have descriptions of the familiar kind given by the ordinary globe-trotter. The author's too fluent and conversational style has led to several blunders in grammar which a careful proof-reader would have corrected. There is a number of illustrations, but neither table of contents nor index.

Schetsen uit Insulinde. Door E. Nijland. Afl. 2-10. Utrecht: C. H. E. Breijer, 1892.

The doubt which arose in our mind when reviewing the first *Aflevering* of this work (p. 109), that the arrangement adopted by the author was not well chosen, has been strengthened into conviction by the perusal of these numbers. Not only do we pass suddenly from missionary establishments to native races, climate, religions, customs, etc., and back to the missionaries—this the title of the book leads us to expect—but the narrative is interrupted by paragraphs in smaller type, and is loaded with notes. The paragraphs in small type are not, as in our school books, independent of the main part of the work, but are often introduced by a short paragraph in large type, or the subject treated of in them is continued in large type. It often occurs, also, that after the reader has become thoroughly interested in some subject, either in the body of the work or in the interspersed paragraphs, he is referred for further information to an appendix. Of the matter of the book we can speak with unreserved praise. It contains vast stores of information on a great variety of subjects, and the author has consulted the works of most of the best-known writers on the islands he describes. After the missions, the natives receive the most attention, and the numerous tribes, their customs and beliefs, and the influence that Hinduism and Mohammedanism have exerted over them, are minutely described. As regards their ethnological relations, too much importance has, we think, been assigned to similarity of language. The inhabitants of Nias seem to be rather too severely judged, especially those of the southern part of the island; their well-built villages and paved roads are evidences of a certain degree of energy and industry. On the whole, however, the author is accurate, and has brought his information up to date; the latest discoveries are recorded, and details are given of the most recent industrial undertakings, such as the railway from Padang to the Ombilien coal-fields. Before he concludes his work, we hope the author will give an account of the industrial condition of the Dutch East Indies in general, and of their probable future; it has been said of late that the natives of Java are becoming impoverished through the destruction of their coffee and sugar crops by *sereh*, and it would be interesting to learn how far this statement is correct. We are glad to learn that a full index will conclude the work, and hope that a map will also be given.

A Journal of a Tour of Discovery across the Blue Mountains in New South Wales. London : B. J. Holdsworth, 1823. Edinburgh : Reprinted by Young J. Pentland for Angus and Robertson, Sydney, 1893. Pp. 48.

We are indebted to Mr. Pentland for one of the few copies of this excellent and handsome line-for-line reprint of Blaxland's scarce journal of his journey across the Blue Mountains—a journey of exploration notable for the difficulties and privations experienced by the travellers, and, still more, for the far-reaching effect it exercised upon the future of Australia, opening up the interior and turning the congested and miserable convict settlement on the coast into a thriving, self-supporting, and important colony. An appendix gives the result of the later expedition by Mr. Evans, by which the value of Mr. Blaxland's discoveries was confirmed. The work was well worth reprinting, and deserves a hearty welcome. Only fifty-five copies have been struck off, of which fifty are for sale.

How to Use the Aneroid Barometer. By Edward Whymper. London : John Murray, 1891. *Price 2s. 6d.*

This pamphlet of sixty-two pages consists of four sections : (1) Comparisons in the Field ; (2) Experiments in the Workshop ; (3) Upon the use of the Aneroid Barometer in determining Altitudes ; and (4) Recapitulation. The investigations here recorded extended, it appears, over a period of eleven years, beginning in 1879-80 during Mr. Whymper's explorations among the Andes. The experiments, with a large number of aneroids, are numerous and interesting, and the author's conclusions confirm the results previously obtained by individual observers with less elaborate equipment. Few who have used the aneroid can have failed to notice the persistency of differences in the readings at a series of points in ascending to a considerable altitude compared with those at the same points in descending ; and those who have discovered this fact must also have noticed that the mean of the ascending and descending readings gave a near approach to the truth. Some have also noticed that, for a time after arriving at a considerable difference of level (or pressure), the aneroid continues to indicate diminishing pressure for some days at least. Mr. Whymper shows that as compared with the mercurial barometer this goes on for seven or eight weeks. Thus, an aneroid whose index-error is zero at sea-level, on being removed to a pressure of 16 inches would probably show an error of, say, −0·2 at first, after a day −0·30, after a week −0·37, after two weeks −0·42, and so on, up to −0·55 after two months ; and yet again, on descending, or under the original pressure, the instrument would only slowly recover this error at the lower level. Hence the usual tests, rapidly applied to aneroids under the air-pump, are of scarcely any value in determining the errors that will appear, especially at low pressures, in actual use.

This phenomenon of a fall in the reading below that of the mercurial barometer, from the moment an aneroid is placed under diminished pressure, has been very fully established by Mr. Whymper. And it is evident that this must lead to an error in heights measured by them, and almost universally in excess—sometimes of considerable amount. The less time that elapses between two observations at different levels, therefore, the more accurate will be the altitude obtained. Old instruments, also, are more sober than new ones—less ready to change their index-errors largely.

One could have wished that Mr. Whymper had tried whether any formula could be discovered that would give approximately the loss which an aneroid suffers from the steady reduction of pressure to any practical extent within a

moderate limit of time: if, for example, d being the diminution in pressure, the immediate loss on the mercurial barometer, or the index-error, could be represented by some such simple expression as—

$$xd+yd^2:$$

where x and y were constants, varying for each barometer, we should have one source of error almost eliminated. And if the variations in these amounts were determined by experiments similar to Mr. Whymper's, for different periods from the first removal of pressure, we might learn whether these variations were subject also to some law dependent on time. Mr. Whymper has taken no notice of the effects of temperature on the aneroid itself: this factor, especially great variations of temperature, may influence the results obtained by this very convenient instrument in some way that may well deserve elucidation by further experiment. Mr. Whymper has done excellent service by his examination, and has made some important points quite clear; possibly, investigation only requires to be carried further to bring the results from aneroid barometers almost to rival those obtained by the mercurial, and thus to render these instruments of the highest possible service to travellers.

Picturesque America. Part I. London, Paris, and Melbourne: Cassell and Company.

The publishers of *Picturesque America* are now issuing this popular edition in monthly parts. The illustrations in the first number are from the pencil of Mr. Harry Fenn. The subjects are striking, and many of the plates are fine specimens of engraving.

The Lairds and Lands of Loch Tayside. By JOHN CHRISTIE. Aberfeldy: Duncan Cameron and Son, 1892. Pp. 94+v.

The characteristics of Mr. Christie's little volume are painstaking care in compilation, with consequent accuracy; incredulity regarding legendary matter when it rests on no historical foundation; and scholarly acumen in research. Besides, the pages are full of local, historical, genealogical, and geographical matter of importance, making the book one of the best local histories we have seen for some time. The glossary of place-names by the Rev. John Maclean of Grantully is full and interesting, although it would have been improved by the addition of ancient forms of spelling, with the proper dates added. There is a good index.

Handbook of Information of Summer Trips by the Steamers of the North of Scotland and Orkney and Shetland Steam Navigation Company from Leith and Aberdeen to Norway, and to Caithness, Stornoway, Orkney, and Shetland. Aberdeen: Printed by G. Cornwall and Sons, N.D. Pp. 64.

As the information contained in this brightly got-up little guide is chiefly confined to descriptions of steamers and routes, particulars regarding fares, facilities provided for travellers, and the like, it does not supersede Murray or Baedeker, one of whose handbooks the intending traveller should provide himself with. Yet the value of the data given is very great to any one voyaging by the Company's fine boats, and the little volume may therefore be very cordially recommended. Most of the illustrations are well produced, and there is a full equipment of maps by Messrs. Johnston.

Guide-Souvenir de Florence et pays environnants. Par le Dr. J. Marcotti. Florence: G. Barbèra, n.d. Pp. 417.

A carefully compiled handbook, with good illustrations and a map showing the new tramway system of Florence. The author remarks that at one time Florence was an extremely cheap place to live in, and that, although it has experienced "l'augmentation générale," it is still, among frequented cities, one of the most attractive places on the score of economy. As very few French people visit Florence, and very many English do, this guide should be translated into English.

Walks in Rome. By Augustus J. C. Hare. 13th Edition (revised). In 2 vols. London: George Allen, 1893. *Price* 10*s.*

In these extremely handy volumes the tourist will find a description of everything he is likely to wish to see at Rome. Mr Hare says: "The travellers who enjoy Rome most are those who have studied it thoroughly before leaving their own homes;" and certainly all intending to visit and enjoy the Eternal City ought, before going there, to read this interesting and most reliable work.

La Terre, les Mers et les Continents: Géographie physique, Géologie et Minéralogie. Par Fernand Priem. Fasc. I. Paris: Baillière et Fils. Pp. 1-184.

This part of Brehm's *Merveilles de la Nature* is intended, as its subordinate title implies, to impart a general knowledge of the leading principles of Physical Geography and the sister science Geology, as far as it is possible to do so in a popular style. It is illustrated by 225 woodcuts, which in many cases serve the purpose for which they were intended. Some few have been selected without reference to the subject under description, while others, useful enough in their proper place, have been inserted apparently at random.

The work covers a wide range of subjects, some of which are treated clearly and well; but, taking it as a whole, it may be doubted whether, even as a popular work n Physical Geography, it can be recommended for general use.

Stories from Indian Wigwams and Northern Camp Fires. By Egerton Ryertson Young. London: C. H. Kelly, 1893. Pp. 293. *Price* 3*s.* 6*d.*

This is a unique book of missionary adventures among the Red Indians of the Canadian Rockies. The writer is a Methodist minister, who since 1868, with his most devoted wife, has been civilising and healing and christianising the Crees and Chocktaws of the region north of Manitoba, about Lake Winnipeg ('the sea') and the Red River. Stories, hairbreadth escapes, adventurous journeys, and missionary preachings, in all seasons and amid all kinds of scenery, are here recorded with a modesty, a humour, and a spiritual earnestness that will delight young and old. Mr. E. R. Young knows the Indians better than most men who have written about them, so that his book has a scientific value of its own. He gives a delightful account of the Scottish half-breeds of the settlement on the Red River founded by Lord Selkirk at the beginning of the century. But we shall content ourselves with stating the legend by which the Indians account for the origin of their unique custom of scalping. When the race first separated into two, the chief of one party offered his daughter to the man who should bring him the head of his rival. After toil and risk indescribable, an Indian managed to secure the coveted head. Traced by the blood dropped on his snowy track he was so nearly caught that he could carry the head no longer, but cut off the scalp to prove his success, and with that managed to reach a place of safety and to win his reward. Mr. Young tells wonderful stories of the missionary dogs and guides, and of their power of running. Truly an instructive and delightful book.

NEW MAPS.

ASIA.

TONKIN, Carte du ——. Scale, 1 : 1,000,000.

—— ——, indiquant les postes militaires et les postes de la Garde Civile indigène. Scale, 1 : 1,000,000.

—— ——, indiquant les communications télégraphiques et postales. Scale, 1 : 1,000,000.

—— ——, indiquant les lignes ferrées et celles de navigation à vapeur. Scale, 1 : 1,000,000.

HÄNOI, Plan de la ville de ——. Scale, 1 : 10,000.

TONKIN. Cartes administratives des Provinces de Bac-Ninh, Haï-Duong, Haï-Ninh, Haï Phong, Ha-Nam, Ha-noi, Hung-Yen, Lao-Kay, Luc-Nam, Nam-Dinh, Quang-Yen, Son-Tay, Thaï-Binh, et des Daos de Dich-Lam, Dong-Trieu, My-Duc, Vinh-Yen et Ninh-Binh. Echelle, 1 : 200,000.

——. Cartes administratives des Provinces de Cao-Bang, Cho-Bo, Hung-Hoa, Lang-Son, Son-La, Thaï-Nguyen et Tuyen-Quan. Echelle, 1 : 500,000.

Presented by the Ministère du Commerce, de l'Industrie, et des Colonies, Paris.

ISLAND OF CEYLON, Topographical Map of the ——. Scale, 1 : 253,440, or 4 miles to 1 inch. *Surveyor-General's Office, Colombo.*

A Topographical Map of Ceylon on the same scale as the *Indian Atlas* has been a long-felt necessity. The only reliable map of Ceylon was in a single sheet on the scale 1 : 506,880, or 8 miles to 1 inch. A comparison of this map with the old one shows the greater accuracy of the new survey at a glance. Although without hills—which is to be regretted—it gives a great amount of detail. The boundaries of the Provinces are printed in different colours, and we notice that, besides the Province of Uva, which was created in 1886, another new Province, Sabaragamuwa, formerly a district of the Western Province, is defined. All railways, principal, minor, and bridle roads, as well as footpaths, are laid down. The map has been lithographed at the Surveyor-General's Office, Colombo, and is published in ten sheets.

ATLAS.

THE UNIVERSAL ATLAS, containing 117 pages of Maps, and an Alphabetical Index of 125,000 Names.

Published for the Atlas Publishing Company, Limited, by Cassell and Company, Limited: London, Paris, and Melbourne, 1893.

The *Universal Atlas*, based upon *Andree's Hand-Atlas*, was published in parts, which have from time to time been noticed in this *Magazine*. To reproduce the work in this country the Atlas Publishing Company, Limited, was formed. The English edition contains 117 pages of Maps and a voluminous Index. Mr. W. J. Turner, F.R.G.S., was intrusted with the translation of the maps and the preparation of the index. Additional maps of England and Scotland, India and Burma, the Dominion of Canada and Australia, have been specially prepared for this edition. The maps are carefully brought up to date, and are very well executed. The printing, which was done in Germany, leaves nothing to be desired.

Island
Craigcrook
Loch
Gogar Loch
Corstorphine

FIRTH OF FORTH
THE SITE OF
EDINBURGH
IN ANCIENT TIMES
After H.M. Cadell
EXPLANATION
Cramond Island
Craigcrook Loch
Canonmills Loch
Lochend Loch
Holyrood Loch
Gogar Loch
Gorgie
Loch
Burgh Loch
Duddingston Loch

THE SCOTTISH GEOGRAPHICAL MAGAZINE.

THE ANGLO-PORTUGUESE DELIMITATION COMMISSION IN EAST AFRICA.

By Captain S. C. N. Grant, R.E.

Article II. of the Anglo-Portuguese Convention of the 11th June 1891 defines the boundary between the English and Portuguese spheres of influence between the rivers Zambesi and Limpopo as follows:—

"To the south of the Zambesi, the territories within the Portuguese sphere of influence are bounded by a line which, starting from a point opposite the mouth of the river Aroangwa or Loangwa, runs directly southwards as far as the 16th parallel of south latitude, follows that parallel to its intersection with the 31st degree of longitude east of Greenwich, thence running eastward direct to the point where the river Mazoe is intersected by the 33rd degree of longitude east of Greenwich; it follows that degree southwards to its intersection with the 18° 30′ parallel of south latitude; thence it follows the upper part of the eastern slope of the Manica plateau, southwards to the centre of the main channel of the Sabi, follows that channel to its confluence with the Lundi, whence it strikes direct to the north-eastern point of the frontier of the South African Republic.

It is understood that in tracing the frontier along the slope of the plateau no territory west of longitude 32° 30′ east of Greenwich shall be comprised in the Portuguese sphere, and no territory east of longitude 33° east of Greenwich shall be comprised in the British sphere. The line shall, however, if necessary, be deflected so as to leave Mutassa in the British sphere, and Massi-Kessi in the Portuguese sphere."

It was for the determination and delimitation of this portion of the boundary that Major J. J. Leverson, R.E., as British Commissioner, left England on 19th March 1892, under instructions from the Secretary of

State for Foreign Affairs. The officers accompanying Major Leverson were Lieut. C. S. Wilson and myself, both of the Royal Engineers, Captain F. E. Lawrence, Rifle Brigade, and Surgeon-Captain H. Rayner, Grenadier Guards.[1]

The portion of the boundary of which the delimitation was the most urgent was that in the vicinity of Massi-Kessi, for it was there that the pioneers of the British South African Company at Umtali were in close contact with the Portuguese settlement of Massi-Kessi; and since that place was accessible from the coast, and was more convenient than any other from which to start the work in hand, it was decided by the Commissioners that the two Commissions should meet there in the first instance. On April 25th the British Commission reached Beira, at the mouth of the Pungwe River. Beira at that time (it was much improved when we passed through it again nine months later) consisted of a number of corrugated iron houses on a low sandy spit at the mouth of the river. Its population consisted of a Portuguese Governor, a custom-house officer, some Portuguese soldiers, and a few English and German storekeepers and agents. There was also a British Vice-Consul. On the land side it is surrounded with mangrove swamps, and the country is flat as far as the eye can see.

We knew that some portion of our work, and possibly all, would be through country infested with the tsetse fly, and it was therefore necessary to arrange for native bearers as a means of transport. With the assistance of the Portuguese authorities 200 carriers had been obtained from Inhambane; these had been brought up the coast by steamer, and sent about 75 miles up the Pungwe River in boats to a station called Mapandas, where their number, owing to sickness and desertion, was reduced to 175. These Imhambane porters remained with the Commission the whole time we were in the country, and did very well indeed. Although they did not carry such heavy loads as the porters the Portuguese Commission had brought for their own use from Delagoa Bay, they worked well, were very tractable, and rose willingly to any emergency.

Before arriving at Beira we had expected to be able to get the Commission baggage, consisting of stores, instruments, and food for the bearers, up to Mapandas, which is practically the limit of navigation for boats drawing 2 or 3 feet of water, by means of the steam launch *Agnes*, belonging to a private company, and some large lighters. When we arrived, however, we heard that the *Agnes*, in trying to get up the river during the previous floods, had run aground, and that the river subsiding had left her high and dry in a mealie field, some hundreds of yards away from the normal bed of the river. Recourse, therefore, was had to small native sailing boats carrying from one to two tons each. These boats took from 36 to 60 hours to get up, and as there was no cover, and the rain came down in torrents during the night, most of us got well soaked, and found our first experience of the river Pungwe decidedly unpleasant.

[1] A Paper dealing with the instruments taken and the surveying operations carried out by the Commission will be found in the *Professional Papers of the Corps of Royal Engineers* for the current year.

The river, about 2 to 3 miles wide at Beira, narrows gradually, until at Mapandas it is only from 100 to 200 feet wide. Higher up, again, although during the dry season the stream is confined to a fairly narrow channel, the width of the sandy bed greatly exceeds this. During the rains the river overflows its banks in the neighbourhood of Mapandas, and nearly the whole country is under water; in fact, during the rainy season of 1891-92, which was by no means an exceptional one, canoes could pass direct from that place to the Zambesi. A paddle-wheel steamer and lighters are now used in carrying up the material for the Beira railway to Fontesvilla, the name given to the railway terminus on the river bank, about 16 miles below Mapandas. A good knowledge of the navigable channel has been obtained; it is somewhat intricate owing to sandbanks, which unfortunately shift a great deal, especially at spring-tides. The lower reaches of the river swarm with crocodiles.

Two days were spent at Mapandas unpacking cases, and making up the loads of 50 lbs. each for the bearers, and a start was made for Massi-Kessi on 1st May. May is, according to report, the unhealthiest month in the year for ascending the Pungwe. It is not actually during the rains, which last from December to March, that fever is most prevalent, but at the end of the rains, when the country is drying up.

Whilst fully aware of the want of success attending previous attempts to take horses up this route, we determined to make another, and brought five ponies from Durban. These, when landed on the coast, were rubbed over once or twice every day with a special anti-fly mixture, purchased at Durban, but to no purpose, for they all died, or became so emaciated that they had to be shot, within a month. An officer of the Portuguese Commission, however, was more successful than we were in getting a horse through this tract of country. The preventive course this horse underwent was daily washing with diluted carbolic acid; and this was so far effectual that at Massi-Kessi the horse was still alive, and to all appearances in good health, when we left that place seven months later.

The distance from Mapandas to Massi-Kessi by road is about 170 miles, or 10 to 12 days' march. For one-third of the distance the track does not diverge much from the river, which it touches again at Sarmento, a Portuguese military post until the cession of the country to the Mozambique Company, when the troops were withdrawn. The track then leaves the river and commences to ascend the watershed between the Pungwe and Buzi rivers, which it crosses at an elevation of 1900 feet above the sea, a little beyond Mendigo's kraal and about four days' march from Sarmento. The road gradually ascends again until, after crossing the Revue river, an affluent of the Buzi, it reaches Massi-Kessi at an elevation of 2500 feet. This route offers no difficulties, but it has few attractions. For two-thirds of the distance the country is uninterestingly flat, and for the entire distance is covered with grass from 6 to 8 feet in height, and to the west of Sarmento it is thickly wooded. Water, either in *vleys* or streams, is abundant, and is found at intervals of 5 to 8 miles, but, until the grass is burned in June and July, little game can be obtained.

At Mendigo's the Commission halted to allow the bearers to return

and bring up more supplies from Mapandas, so that Massi-Kessi was not reached until 30th May.

The difficulty about transport was caused by the necessity of carrying food for the bearers themselves. Very little was known of the country through which the frontier was to run south of Massi-Kessi, but all information tended to confirm previous reports of the probable difficulty of obtaining meal or rice in the country, especially since the crops were known to have more or less failed the previous year from drought. It was therefore necessary to be prepared, until we could ascertain for certain the resources of the country, and 400 loads of rice, forming 50 days' supply for the bearers, were in the first instance taken up from the coast. During the march south, it was found possible to obtain about two months' supply by barter, and some meal was purchased at Massi-Kessi. The ration given to the carriers was 2 lbs. of rice or meal a day; on this they carried continuously loads weighing from 50 to 60 lbs., from 15 to 20 miles a day; and assuming that bearers whose loads have been expended cannot be sent back in parties of less than five, we have the data for an interesting calculation—to determine the best arrangement and least number of bearers required to carry a given number, say 50, of loads of stores, instruments, etc., a distance of 400 miles from the base, and to return. It would have been cheaper, and certainly less trouble, had the nature of the ground permitted wheel transport, to have used bullock waggons, even if we had lost all the oxen and burnt the waggons several times over.

Massi-Kessi is situated near the head of the Revue valley, and is immediately surrounded on all sides except the east by hills rising 2000 or 3000 feet above the level of the valley, and its climate, as might be expected, is much less bracing than that experienced on the higher and more open ground. It consists, on the north side of the river, of a store, called the "Fort," belonging to the Mozambique Company, and, on the south side, of a few huts occupied by the Portuguese officials and some five or six stores kept by Englishmen. The nearest station of the British South Africa Company is Umtali, about 16 miles west of Massi-Kessi. Formerly the track from Mapandas to Umtali ran through Massi-Kessi, but a new waggon road, made last year by Mr. Selous for the British South Africa Company from Umtali to Shimoia, the anticipated terminus of the railway from Beira, passes two or three miles south of Massi-Kessi.

During the greater part of June the Commission was engaged in determining the longitude of Massi-Kessi, reconnoitring the country, measuring a base line, and starting a trigonometrical triangulation and survey. It was foreseen that the adjustment of the boundary between Massi-Kessi and Umtasa's would be a difficult task, and a special survey, on a scale of two geographical miles to an inch, was commenced and finally completed over about six hundred square miles of country, extending from Massi-Kessi to latitude 18° 30′ S.

The longitude, determined by moon culminations with a portable transit, of the camp at Massi-Kessi was 32° 51′ 23·7″, which placed it some miles more to the east than its previously assumed position, which was anywhere between 32° 30′ and 32° 50′ E. It had apparently been

determined previously only by route sketches of travellers coming up from the coast, who probably generally over-estimated the distance marched; and, indeed, the longitudes of places on the coast itself have not until very lately been accurately ascertained. South of Massi-Kessi this error in longitude remained about the same, but to the north the positions of places, as shown on existing maps, were more correct, owing, probably, to their having been determined relatively to points on the Zambesi which had themselves been more accurately fixed.

About the beginning of July the Commission commenced work towards the south. On leaving Massi-Kessi the road follows the foot of the mountains on the west, which jut out as short ranges from the high ground forming the watershed of the Buzi and Sabi basins. The ends of these ranges rise very abruptly from the plain to an elevation varying from 1000 to 2000 feet above it, and are in some instances higher than the watershed itself.

The survey of the country extending 160 miles south of Massi-Kessi was based on a trigonometrical triangulation. The country, as far as the Chimanimani Pass, was covered with trees, chiefly *mopané*, wild loquats, and stunted acacia, but very good observing-points were obtained on the mountains on the one hand, and on the detached hills or *kopjes*, which were scattered over the plain, on the other.

The months July and August were not a good time for surveying, for the tall grass was still standing, rendering marching, except on the native paths, extremely slow and arduous. The natives were commencing to set fire to it in some places, and the atmosphere was rendered very thick by the smoke of these fires, so that six or seven miles was the average length of our observed lines.

There was a marked difference when we returned over the same country in October. All the grass had been burnt, and the air cleared by the thunderstorms which had then commenced.

About four miles north of the Great Musapa river the mountainous country extends much further to the east, and the road leads over the Chimanimani Pass, 5130 feet above sea-level. Between the Great Musapa and Lusita rivers the path runs nearly parallel to the Haron river. The mountains on the left bank of the last mentioned rise up, with an almost vertical scarp, some 2000 or 3000 feet above the surrounding country.

The Lusita river, about 50 yards wide where we crossed, runs in a deep valley, and its southern bank is more thickly wooded than any portion of the country through which we passed.

After passing the Lusita river the country continues, hardly mountainous, but very hilly and open; and here buck of various species were, perhaps, more plentiful than at any other part of our line, although eland had been fairly numerous between Chimanimani and the Lusita.

The Buzi was crossed near its source, where the width of the stream was only from 30 to 50 feet.

The Umswilizi river was explored from its source to its confluence with the Sabi. It runs for the most part in a very deep valley, the sides of which are in places so steep as to form a gorge. The river itself falls

in a succession of rapids and pools, and here was some of the most interesting scenery on our route. So steep are the banks that we had to cross the river constantly in marching up the valley.

A short distance beyond the Umswilizi the country to the south changed to a more or less flat plain, covered with trees, a combination of features about as ill-adapted for triangulation as can be imagined. In fact, rigid triangulation could no longer be conveniently carried on, and it became necessary to fix points as far as the river Sabi by observed latitudes and azimuths.

The bed of the Sabi, where we crossed it, in longitude 32° 31′ E., is an expanse of sand, from a quarter to half a mile in breadth, the stream at that time of the year, August, being about 100 yards wide and 18 inches deep. The banks are six to eight feet above the bed of the river, and the country, though flat, shows no signs of periodical inundations. A few miles above the point where we crossed are some falls or rapids of considerable size; but the Commission had no time to make any special survey of them.

The junction of the rivers Lundi and Sabi was found to be only a mile or two west of longitude 32° 30′, so that the Commission was not delayed there by having to carry out an extended survey along the Sabi. The altitude of our camp near the junction was only 560 feet; it was certainly the hottest one we had, although in reality the temperature in the shade did not exceed 100° Fahr.; but this, combined with the glare of the sand, rendered working throughout the day not a little unpleasant.

The country between the Sabi and Limpopo was almost unknown, and very little information could be obtained about it from the natives. Water was believed, and afterwards found, to be very scarce. Tracks were few, and it was uncertain whether we should find one to lead us anywhere near the straight line which was to form the boundary. The probability of being unable to obtain food for the bearers rendered it necessary to make this march—from the Sabi to the junction of the rivers Limpopo and Pafuri and back—as rapidly, and with as small a party, as possible.

The tract of country through which we passed forms a level tableland, to which we rapidly ascended after crossing the river Lundi, and from which we descended at about a day's march from the Limpopo. It is broken by no irregularities of surface. Several rivers, or rather riverbeds, were crossed, in wide channels, but shallow, and with clean, sandy beds. In none of them was any water running, although water for drinking could be obtained by digging one or two feet into the sand; but that was always thick, turgid, and sometimes ferruginous.

At a kraal about forty miles from the Sabi, the natives, who professed to know the position of the junction of the rivers Pafuri and Limpopo, informed us that it could be reached by two routes; one, the more northern, being the shorter, but so scantily provided with water that they refused to guide us by it. We had therefore to go by the other, which took us a long way to the south and east. The distance between the two points is, in a direct line, about 112 miles, whereas the road we

travelled measured 185 miles. The track passes through several kraals, but many of them, owing to the famine caused by the drought of the previous season, were deserted; the inhabitants were at the time living in small groups in the forest, and subsisting on such roots or fruit as they could find. The whole country was covered with thin grass, scrub, and stunted trees. On the eighth day's march we had reached the latitude at which the Limpopo was shown on the maps we possessed. We were all fairly tired, if not with the march—although we had been doing close on twenty miles a day with insufficient and impure water—at all events of its monotony, for the trees had always limited our view to one or two hundred yards, the country had been uninterestingly flat, and, with the exception of one herd of sable antelope, we had seen no game, and we were looking forward to twenty-four hours' rest on reaching our goal before commencing the return journey. But it was not until midday on the next day's march that we suddenly came to a clearing in the trees, and found ourselves on the edge of the plateau, looking down on a broad flat valley. About ten miles off the position of the Limpopo could be made out, at some places by stretches of white sand, and at others by a line of high trees growing on the banks in its vicinity.

The soil in the valley was, of course, alluvial, very black in colour, and much cracked in drying, and it looked very similar to the black, cotton soil in Bombay.

There are kraals on the river banks, but as they are not built on any marked eminences, it is presumable that floods, if they take place at all, are not of any great depth.

The bed of the river is about half a mile wide, with a clean, sandy bottom, and divided up into channels by a number of islands of alluvial soil, kept together by the roots of the jungle and grass growing on them. The channel of water was about 50 yards wide, and from a foot to 18 inches deep. The banks, to about a mile from the river, were thickly wooded. The natives stated that crocodiles were numerous, although we saw none; but the explosion of four ounces of dynamite killed in one pool 200 fishes of an average weight of over a pound each.

We were still in the famine area, and could get no meal. By sending some local natives under one of our own *indunas* a long distance we were able to obtain a few pounds of mealies. The meal we had brought for our carriers was running short, as the march had taken two days longer than we had anticipated, and it was necessary to get back to our *dépôt* on the Sabi as quickly as possible, but it was equally necessary to stay twenty-four hours to give the carriers rest. They had marched the 185 miles, over stony, gritty paths, in ten days, and many of them were showing signs of lameness. Major Leverson decided to try the northern and shorter route back, in spite of the reported scarcity of water.

The result justified the decision, for we obtained sufficient water, although it was very bad, and gained two days in the march, getting back to the Sabi in eight days. Altogether, the 315 miles were covered in eighteen days, excluding the one day's halt on the Limpopo river. As regards the survey, road sketches were made of the route, and observations for latitude and longitude taken every night, time being carried by means of four half-chronometer watches.

Our determination of the longitude of the junction of the Limpopo and Pafuri differed from that obtained by Captain Frere d'Andrade in 1891, who carried chronometers from Delagoa Bay, when laying out the boundary between the Portuguese province of Lorenço Marques and the South African Republic, by only 900 yards.

To expedite the work, the Commission had been divided into two parties. These re-assembled at Massi-Kessi about the middle of October. The rains had to some extent commenced; in the middle of September we had had a thunderstorm on the Limpopo river, and in the early part of October, three days' continuous rain on the Lusita. The weather had become generally unsettled, with heavy thunderstorms at night, the days being usually fine; but it was still desirable to get more work done, and on the 24th October the Commission left Massi-Kessi to proceed northwards. The country, extending from the water-shed between the rivers Odzi and Pungwe on the west and longitude 33°E. on the east, we found to be extremely mountainous, some of its peaks being 3000 or 4000 feet above the height of Massi-Kessi. The thirty-third meridian was surveyed as far as the source of the Gaeresi river in lat. 17° 57′ S. Thunderstorms were now becoming more frequent, and during the day the hills were for the most part of the time covered with clouds and mist, which rendered continuous field work almost impossible. Major Leverson, therefore, decided to return to Massi-Kessi with the party; he was detained twenty-four hours on the banks of the Pungwe, being unable to cross on account of the floods coming down the river. The whole Commission reassembled at Massi-Kessi on the 12th November, and left two days later for Beira.

On the march up the Pungwe in May a few showers were experienced during the night, but these were nothing to speak of, and did not necessitate our pitching tents, as a bivouac could generally be arranged under trees sufficiently thick to keep off the dews, which were very heavy. The early mornings, just before sunrise, were cold and raw, and as one brushed through the grass, wet with the night dew, large drops of icy cold water falling down one's neck were anything but pleasant. The days were not unduly hot, and the grass shaded one a great deal from the sun. As we approached nearer to mid-winter and to higher altitudes, the climate was pleasant. At Massi-Kessi, at an elevation of 2480 feet, four blankets and an ulster coat were only just sufficient to keep one warm in the early mornings. Here, and in all the high country down to the Sabi, the air was invigorating, but on the Sabi and between that river and the Limpopo the elevation of the country rarely exceeded 1000 feet above sea-level; this, combined with the advance of the hot season, rendered the temperature higher and the air less bracing. The nights, however, were cool, except perhaps on the Sabi; and until we were within two days' march of Beira, at the end of November, a blanket was generally desirable.

As I have before stated, we experienced our first thunderstorm on the 20th September on the Limpopo, and in the beginning of October three days' continuous rain on the Lusita; between these dates we had occasional showers, with fine weather in the intervals. This rain was

general, for it was experienced by some members of the Portuguese Commission, who were then north of Massi-Kessi. After this the weather cleared again, and we had two or three weeks' delightful weather. In July and August the air was very thick and hazy, owing no doubt to the smoke caused by the natives setting fire to the long grass; but in October the grass had been burnt, and the rain had cleared the atmosphere, rendering distant objects exceedingly clear.

During the first half of November thunderstorms again became very prevalent, generally taking place at night. The days were as a rule fine, but the hills were constantly covered with fog and mist. On the march down the Pungwe, during the latter half of November, we experienced one or two very heavy showers between Mendigo's kraal and Sarmento; and all the way to Mapandas the sky was, fortunately for us, much overcast. As we approached the coast (it was then nearly midsummer), the heat increased and culminated at Beira, where we also experienced, for the first time to speak of, mosquitoes surpassing in number and ferocity those of any place I have ever been in. Beira was much enlarged since we passed through in April, in consequence of the commencement of the railway work at Fontesvilla, about 50 miles up the river. The ground on which the town stands cannot be said to fulfil the ideal conditions of a healthy site, but nobody seemed to complain of its unhealthiness; on the contrary, the residents appear to claim its right to be regarded as a sanatorium.

As regards the health of the party, none of the five officers who proceeded direct from England can be said to have suffered, whilst in the country, from any sickness directly attributable to the climate, but one had some slight touches of fever on the voyage home. Three of the five non-commissioned officers suffered, however, towards the end of the work from fever and dysentery. Lieut. C. Chamley Turner, 1st Royal Scots Regiment, and five policemen who were attached to the Commission from the British South Africa Company, and who had all, I believe, had fever previously, had recurrences from time to time, and at the beginning of September Lieut. Turner—a smart officer, and the most pleasant and obliging of companions—succumbed to the disease at our camp, about 30 miles north of the Sabi. This was the only death amongst Europeans or natives during the expedition. On the whole the climate appeared to be healthy, but Englishmen should nevertheless be extremely careful to take every precaution, more especially against chills, which must be observed by them in tropical climates.

Along the entire route the natives were very quiet, and appeared to take little interest in our movements. They are not industrious, and cultivate absolutely nothing but just sufficient Kafir corn for their own immediate wants. In some districts a few goats could be bartered for, and chickens, also honey and sweet potatoes, but even these could not always be obtained. The natives whom we saw appeared to vary little in physiognomy. The men were tall and well made, and were much more refined and intelligent in features than the women. In the neighbourhood of Massi-Kessi many of the natives carried guns of a very obsolete pattern, which generally looked as if they would be more

dangerous to the shooter than to the object shot at. South of Chimanimani assegais and bows and arrows were the universal weapons.

The natives are adepts at trapping game, and some parts of the country are literally covered with pits and other devices for catching game and vermin. The pits on more than one occasion caught members of our party. The game on the Pungwe river has been so much written about lately that I need give no description of it here. In the neighbourhood and south of Chimanimani we found numbers of eland, and between the Lusita and Sabi antelope of various kinds. Between the Sabi and Limpopo we saw only two herds of sable antelope, and the spoor of an ostrich and of a giraffe. Lions never gave us much trouble, their attentions being confined to a little growling round the camps at night: the localities where they appeared to be more numerous were the Pungwe river, Massi-Kessi, and between the Buzi and Umswilizi rivers.

For the following notes on the geology of the tract of country traversed by the Commission I am indebted to Captain Frere d'Andrade, a member of the Portuguese Commission, and formerly Government Inspector of Mines for the province of Mozambique.

All the country of Manica, extending from lat. 18° S. as far as the mountains, including the sources of the rivers Umswilizi and Buzi, is composed chiefly of ordinary granite, in which the mica is both black and white, and the crystals of felspar small. In the neighbourhood of Massi-Kessi this granite has upheaved some schists, which appear to belong to the Lower Silurian system, and which form the mass of the mountains Venga and Shiromiro, and extend thence a few miles to the north to the base of Mount Shuara, and to the west as far as the valley of the Chua. Towards the south they occur again at Massi-Kessi, and extend to the foot of Mount Vumba, which is itself composed of granite. The schists occur again midway between Mount Vumba and Chimanimani, and form the nucleus of the very prominent range of mountains which, rising some miles north of Chimanimani, extends to the Lusita river. They vary in colour, being brown or reddish-brown and green, are slightly lustrous, and sometimes, but not often, talcose. These Chimanimani mountains have been formed by the upheaval of the schists through an eruption of diorite which first appears at the foot of Mount Vumba, and reappears in the valley of the Little Musapa river, and again in the valley of the Zoma river.

This upheaval of diorite has tilted the strata of schists on both sides to an almost perpendicular position, and these latter—which, both by reason of their texture and the perpendicularity of their beds, have been eroded to a less extent than the former—now form the enormous perpendicular scarps of the Chimanimani mountains of which the peaks reach an elevation 3000 feet above surrounding country.

These upheavals have produced a series of faults and a field of fractures of which the principal directions are of one set nearly north and south, and of the other nearly east and west, both following the general directions of the mountain chains of the district. It is the infiltrations into these fractures which form the gold-bearing veins or dykes near Massi-Kessi and Umtali.

At a point about five miles south of Mafussi's kraals appears a siliceous sandstone, alternating with beds of schists, also belonging apparently to the Silurian system. These two rocks appear very often in the valleys of the streams forming the sources of the Buzi river, but otherwise the country is almost entirely composed of granite. The schists are also met with in the mountains on the left bank, and in the valley, of the Lusita. Farther south the schists and granite disappear, and are replaced by a band of basalt, of which consist the rocks forming the gorges of the Umswilizi river. On the east, however, the granite continues, forming the bed of the Buzi, as far as its junction with the Umswilizi. The plain between the Umswilizi and the Sabi is also formed of the same siliceous sandstone, but here a reddish-brown rock also crops up closely resembling that which forms the defiles of the Sabi river—apparently a porphyry composed of quartz, felspar, mica, magnetite, and augite. This rock is absent in the country between the Sabi and Limpopo, but reappears south of the latter river, and forms the principal masses of Mount Libombo, which separates Lorenço Marques from the Transvaal. In travelling westwards from Beira one finds granite on the Pungwe at Sarmento, on the Buzi at Murrivane, and forming all the detached peaks between Mendigo's kraal and the main range of mountains at Massi-Kessi.

Near Garuja on the Buzi is a band of fossiliferous limestone—perhaps a prolongation of that found near Sofala. With the exception of this band of limestone all the country to the east of the granite is composed of the alluvial deposits of the Pungwe and Buzi.

No auriferous conglomerates like those in the Transvaal are met with, but gold is found in the sand of all, or nearly all, the rivers, though not in sufficient quantities to be worked by Europeans. There are no *placers*, but veins of quartz, generally poor, in which the gold, associated with iron pyrites, appears to diminish in quantity with the depth. Gold ought to be found in connection with the eruptive diorite, but all the gold washed out by denuding agents, which under different conditions has been retained in California and Australia, has here been carried into the sea.

North of the Pungwe the country in longitude 33° E. is composed of granite, but the schists and sandstone, similar to those found south of Massi-Kessi, reappear.

AMONG THE CAMPA INDIANS OF PERU.

By D. R. URQUHART, C.E.

BEING sent on a surveying expedition to the upper tributaries of the Amazon, I had an opportunity of becoming acquainted with the natives of that region, and of observing some of their customs. In the following sketch I do not propose to furnish geographical or topographical data: I shall only attempt to give some idea of the people, their habits and character.

The river on which our work chiefly lay was the Perené, and in order to reach it we marched inland from the west coast, and crossed the snow-tipped cordillera of the Andes, descending thence down the valleys into the land of the Chunchos.

What the derivation of the word "Chuncho" is I cannot say, but the Peruvians use it to signify any uncivilised Indian, or rather, as far as I can discover, any Indian who does not wear pants. For instance, there are the Indians up in the cordillera. They are not Chunchos, and it is not of them I intend to write. Their character may be summed up very briefly. They are dirty, drunken, cowardly, and treacherous. Reticence is also one of their distinguishing traits, and their one desire is to be left alone with their lamas and their priest. The latter is indeed the only white man who can handle them; and that he does so to some purpose is shown by his invariably flourishing condition as compared with the miserable state of his flock. These Indians are an entirely negative and uninteresting people, who will not give, or even sell, to the traveller passing through their country so much as a drink of water, as I can testify from a sojourn of some years among them. It is true, however, that the treatment they have received from the Whites has been, and still is, of the most shameful kind. On this matter I can speak from experience—with regard to the Bolivians at least. There is no doubt that in the recesses of every one of the Indians' souls there lurks a hereditary and inextinguishable hatred for the descendants of the murderers of the divine Atahualpa—"the last of the Incas." By the way, it is a curious fact that their women still wear a black strip round the dress as mourning for that great chief. The pure race is rapidly dying out, its place being taken by the more sturdy and intelligent Serrano, a cross between Spaniard and Indian. Their native languages are Quechua and Aymara.

Descending the western slope of the Andes by the valley of Chanchamayo, we soon find ourselves in a warmer and more fertile country. Extensive plantations of sugar, coffee, rice, etc., are seen on every hand. Here the labourer is the Chinaman—the slave of only a few years ago. An old Celestial who accompanied us had many stories to tell of his serfdom; but, just as there is Chinese English, so there is Chinese Spanish (which *he* spoke), and it was rather difficult to understand him. It sounds strange to English ears to hear a man say, "In the year so-and-so Señor X. bought me, and sold me to Señor Y. in such-and-such a year;" or, "Señor X. was a good boss—only had me lashed twice," etc.; and all in the matter-of-fact way which seems so natural to an Oriental.

Travelling onwards, we soon leave behind all plantations and other signs of civilisation, and enter a country displaying scenery of the grandest and most impressive kind. The roads become worse and worse until they are impassable to the four-footed animal, and farther on even to the biped. Only the Chuncho can now find his way along; and, if we would penetrate farther into the interior, we must have recourse to rafts and Chuncho guidance on the river. This is the home of the Campa Indian, a race little known, and as yet practically untouched by civilisation.

In the valley of Chanchamayo, and on what may be considered as the outskirts of civilisation, there are two villages (called towns in this sparsely populated country)—first, Fort San Ramon, and some eight miles farther in, La Merced. Until about twenty years ago the Campas carried on an intermittent war with the Peruvian authorities, and San Ramon was the point against which their hostilities were mostly directed. Formerly it was necessary to have forces stationed there constantly in order to repel the repeated attacks of these Indians. They have now been driven back, however, La Merced has been erected, and an unstable peace prevails—although brawls are not infrequent in the town, and result in the death not only of Indians, but of Europeans and Americans also. The country from here towards the interior is particularly favourable for ambuscades, a characteristic which has often been taken fatal advantage of by the Redskin.

Of the Chunchos, the most numerous and powerful tribe, and the bravest, is undoubtedly the Campa. Their number is difficult to estimate even approximately. It is probably somewhere between five and ten thousand, although nothing like this number ever takes the field at one time. They have no elected chief, and probably have not had since the year 1530, when Atahualpa, the Inca king of all these tribes, was slain by the Spanish captain, Pizarro. Theirs is a community where every one does pretty much as he thinks fit. In each small cluster of houses, however, which we passed, there was always one man who was looked up to by the rest, and was in some degree a chief. It must not be supposed that crime is on this account allowed to go unpunished. We had evidence to the contrary on our journey down the Perené. It appeared that a Campa, in a fit of drunkenness, had brutally murdered his mother, and then fled to the woods. A few weeks later, on our return journey, we heard that he was still in hiding. At every hamlet the same indignation was expressed. Not an Indian but would kill him on sight; and the wretch could scarcely long escape eyes that detect the turning over of a leaf, and penetrate to the darkest recesses of the forest. To seek refuge with another tribe would, of course, be "out of the frying-pan and into the fire."

The Campa Indian is not, as a rule, of high stature, although there are many notable exceptions. Their dress makes them appear taller than they really are. About five feet six inches is a common height, but many of them are much taller. Lithe and lean, with curved nose and receding forehead, they are fine specimens of the Indian race, the fierce, gleaming eyes marking them as untamable and dangerous to

rouse. Their dress is a tunic called the *kushma*. It is of a brownish colour, and generally long enough to sweep the ground. They use no protection for the feet. The head-gear consists of a band made from wild cane, some two inches broad, at the back of which are stuck one or more of the long, straight, brilliant, blue-and-crimson feathers of the macaw. The hair is allowed to grow long, but is cut short in front to keep it out of the eyes; the rest hangs about the neck in black, tangled masses. With rare exceptions, the face of the Campa is entirely devoid of beard. On this account it is sometimes a little difficult for the inexperienced stranger to tell whether he is addressing a male or a female. A glance at the *kushma* will solve this difficulty, however; for it is an invariable rule that in the case of the man the aperture for the head is cut down the breast and back, while in the case of the woman it is cut crosswise over the shoulders.

In features the Campas are very varied. There is the pleasant, almost European, face, with large mild eyes; there is the stately, immovable expression of the Inca; and, again, a low caste of features—somewhat common—narrow forehead, thick lips, and large, coarse mouth, all denoting the animal and the savage. They perforate the nose, and insert a small piece of cane between the nostrils, so that that organ is usually somewhat distorted. The more prosperous have small silver ornaments hanging from the nose: these they seem to value very highly, for on no consideration can they be induced to part with them.

There is one characteristic common to all Campas, and one which is hardly in keeping with the current notions of an Indian—a tendency to spontaneous laughter of the most boisterous and infectious description, for the slightest cause or for none at all. More than once it happened that, while we were resting by the river's bank, some trifle struck a Campa as being too comical. He broke forth into the peculiar laugh affected by all—a hearty peal, winding up with a shriek. This was taken up by another and another; of course it grew irresistible, and finally all were convulsed, ourselves included. If any one had come along and asked to be let into the joke, none of us could have told it. Neither have these people any respect of persons, for they will laugh in the face of whoever provokes their mirth. The good fathers of San Luis assured me that the greatest obstacle to be encountered in the conversion of the Campa is this tendency to make light of things, even the most solemn—that he is a *burlon* (mocker).

The Convent of San Luis is situated on the river Paucartambo, a tributary of the Perené. It is not in Campa-land, but in the territory of another and much less powerful tribe, the Amueshas. They are of a very different character from the Campa. Humble and cringing, they will steal on all possible occasions whatever they can carry off. Now, there is a most remarkable and almost incredible trait of character in the uncivilised and savage Campa, one which is certainly not to be found among much more cultivated people—under no circumstances is he ever known to steal. Should he find anything, however petty or insignificant, he will invariably endeavour to discover its owner. Not a thing was abstracted from our camp during our sojourn in their country, although

articles most dear to the Indian's heart, such as axes, clearing choppers, etc., were, of course, plentifully strewn around. Doubtless his intercourse with the white man will change all this; but I think that in the meantime such a peculiarity certainly denotes an approach to "the noble savage" of Fenimore Cooper's fiction. If suspicion of theft fall on one of them, he is regarded by the rest with much contempt, and children caught stealing are punished in a severe, though somewhat ludicrous, manner which I could hardly with modesty describe.

With regard to San Luis, nothing can be more praiseworthy and exemplary than the abnegation displayed by the monks of that convent. They live entirely out of the civilised world; and as they are continually wandering to and fro in these comfortless wilds, theirs is a life of the utmost hardship and frequent peril. One of them accompanied us on our trip down the Perené; and, as he and I occupied the same raft for some time, I had an opportunity of informing myself as to their operations—how they manage to "get at" the Indians.

It appears that the humble Amuesha readily embraces the doctrines of Christianity—outwardly at least; but that the ribald Campa will give way to uncalled-for hilarity on the most unexpected occasions. Probably the truth of the matter is that the Indian accepts the Christian's faith unhesitatingly, at the same time cleaving to his own religion also, though he does not openly confess it. Hence the Chunchos at present practise a curious mixture of Christianity, idolatry, and sun-worship.

Apart from the cynicism referred to, three great, and apparently almost insurmountable, obstacles confront the would-be Christianiser of the Campa—namely, sun-worship, polygamy, and belief in witchcraft. The first two may perhaps be regarded as matters of opinion; but the consequences attendant on the last are terrible. Could such superstitions be eradicated, or at least modified, a good work would surely be done, and many a cruel and horrible scene prevented. I shall have a word to say on witchcraft further on.

The Campa invariably paints his face—a bright shining red being the prevailing colour, though blue and black are also used. Great ingenuity is shown in varying the patterns. The pigments are of vegetable origin and harmless to the skin. So decorated the Campa looks hideous, and, to the European accustomed only to read of "the Indian in his war-paint," even appalling. The colouring matter is simply used, however, for the same purpose for which it is sometimes applied at home, namely, to beautify. The first occasion on which I saw Campas was in the woods, where I happened to be working. The appearance of the figures marching in Indian file down a rugged path winding through tropical vegetation seemed like a scene in some fantastic pantomime.

On the war-path their costume is changed. The *kushma* would somewhat impede quick action, so it is cast aside and a simple strip round the loins is substituted. The body is coloured a reddish hue, and only one side of the face is painted. The weapons chiefly in use are bows and arrows. Although the Campa poisons his arrows for the chase, I have been assured that for warfare it is not his custom so to prepare them. Of this, however, I rejoice to say I have had no personal

experience. The points of the arrows are barbed, and formed of a black, exceedingly hard wood, found as a sort of crust growing inward on a species of palm. The bow is of the same material. The body of the arrow is of cane, and the feathers are arranged in a spiral so as to give the missile a rotary motion in its flight; it is therefore evident that the Campa quite understands the principle of rifling. At a short distance one of these arrows may be shot by a novice so as to penetrate a plank an inch thick.

The women are of very slight figure. Many of them I saw, although carrying children, looked like girls of twelve or thirteen years. As a rule they are not pretty; but it is hardly possible to speak with certainty, as they, with feminine coquetry, paint the face in so many fine streaks of blue and red as almost to conceal it. Their faces look, indeed, more like masks than human countenances. They were very shy of us at first, having probably never seen a white man before; but in spite of this timidity and of the dire punishment which awaited them if caught, their husband's backs were no sooner turned than they commenced to flirt outrageously. The Campa does not treat his wives (he may have as many as he pleases) as human beings at all. They eat apart from the men, and are not allowed to be present at the councils; and should a man suffer any loss, he is prone to give vent to his ill-temper by clubbing his wife on his return home.

I have referred to the scenery. It is often very lovely, reminding one of our own Scottish Highlands seen through a magnifying glass. As we floated down the swift Perené a continually changing panorama was presented to our view, of which, however, there was little time to make detailed notes. Our method of locomotion was novel and of the most primitive kind. There grows by the river an exceedingly light wood, called in Spanish *Madera de balsa* (raftwood—I cannot give its scientific name), which seems placed there on purpose to aid the Indian in his movements from point to point. Some five or six poles of this wood, each about six inches in diameter and fifteen feet long, are selected and pinned together with the hard wood before mentioned. One end of the raft so constructed is slightly tapered to form a bow, and the other slightly bevelled underneath to form a stern. Then, for seats, a few short pieces are placed across the raft and two thin poles are laid on them lengthwise, at such a distance apart as to produce the maximum of discomfort. The whole is pinned together with the same black hard wood. When complete, the rafts are about two and a half feet wide and fifteen feet long. They vary, however, in size. They look clumsy, heavy structures, but are in reality so light that two men can easily lift and carry away the heaviest of them, which are considerably larger than that described. They are managed by two Indians standing one at each end.

In passing rapids, every one who happens to be clothed gets soaking wet; and the costume of the Campa is very often purposely limited to the band round the head with the feather behind. This is scarcely conventional; but, standing erect in a roaring, boiling torrent, with paddles flashing in the air, as the raft flies over some foaming rapid, he

forms a striking picture. The passenger sits amidships, perhaps at first a little inclined to nervousness, which is not allayed by the conduct of the Campa, who incessantly jabbers, laughs, and yells, tumbles into the river and scrambles on board again.

Manned by such a crew, it is naturally by no means an unknown thing for a raft to get capsized; but there is little danger to the stranger who trusts himself implicitly in the hands of these people and avoids giving offence.

The rapids are in many instances so shallow that in passing them the raft strikes the bottom. Navigation by boat or canoe is therefore out of the question. The skill displayed by the Campas in handling these rafts, particularly by the stern raftsman, who of course occupies the position of responsibility, is very remarkable. The greatest difficulty in shooting a rapid is to keep the raft in a proper position, and, owing to the currents, the management calls for some art even in the quietest places. I had experience of this. We were in the habit of killing fish for the Indians with dynamite. Having selected a broad, deep pool for the explosion, and stationed the Campas farther down the river in shallow water, we fired the shot. Immediately the water was alive with splashing, shouting Indians, and of the hundreds of half-dead fish which came floating down but few escaped. Another of our corps and myself found ourselves on one such occasion in a shallow. Our raft was managed by two Indians, father and son. As the fish came down and the excitement heightened, the younger quickly doffed his *kushma* and sprang into the river. The old man kept shouting out orders and working himself into a state of considerable enthusiasm, until, unable to restrain himself, he also, without stopping to undress, dashed into the water, leaving my friend and myself in an awkward predicament.

We each took a paddle and started to work with some confidence, as we thought this one of the easiest points we had passed. In spite, perhaps in consequence, of the too numerous mutual instructions, the raft drifted slowly down, and we should inevitably have been drawn over the rapids had not our elderly Indian friend come to our rescue just in the nick of time. The fact is, these rafts are much lighter than they appear, and spin about under the influence of the current and the strokes of the paddle in a way which seems to defy all natural laws, and is very bewildering to the amateur.

An accident which occurred at an early stage of the survey also showed us the necessity of obtaining Campas well acquainted with the river and careful in their work. The rivers Chanchamayo and Paucartambo join to form the Perené, the left bank of which is here a precipitous rock, with a whirlpool, or rather large eddy, of a dangerous character at the base. One morning a raft, manned by a Campa lad and a Chinaman, started to cross from the right to the left bank. The Chinaman was one of the curious specimens of humanity to be found in this country, who have lived among the Chunchos from infancy, talk their language, marry their women, and have forgotten, or perhaps never knew, their own people. Our interpreter also, a man of Italian parentage, was such a one. The Indian boy was a veritable imp. Short, squat,

and ugly, his weakness was to let his raft be carried over the most dangerous passes; but he had the reputation of being always able to come out safely. Although useful in many ways, Kintsi (as he was called) was a source of much trouble.

The raft, having been hauled a sufficient distance up the stream, was pushed off, and went flying down the current, which is almost torrential at the confluence. Under the impulse of the paddle-strokes, however, it crossed well. Unfortunately, on approaching the left bank, it was drawn into the eddy, suddenly whirled round, and dashed against the rock with such violence as to pitch overboard the Chinaman, who, although a good swimmer, sank immediately. The Campa kept his feet, and with some difficulty landed in safety.

About a fortnight later, farther down the stream, we passed a human skull and scattered bones, bleaching on the bank. Kintsi assured us that they were those of the drowned man. He seemed perfectly certain as to the identity, which did not surprise me much, as I had noticed that on the day after the accident he was wearing the dead Chinaman's clothes.

Vultures commence the work, which the red ants finish; and where these exist, the preparation of the skeleton of a man or other animal is only a question of hours.

The Campas have no method of counting time except by the new moon. "What do we want with clocks? We sleep when we're tired, and eat when we're hungry." Such was the answer I received to my query from Kintsokeri, a mild, rather intelligent Campa chief, who spoke Spanish. When I spoke to him about the priests he laughed dryly, and said they were *buena gente* (good people) and always welcome.

The language of this people does not seem at all a difficult one, but I had little leisure for making myself acquainted with it. The Amueshas, who are a neighbouring tribe, speak an entirely different tongue, and perhaps every other tribe has its separate language.

We sometimes had to make our beds on the ground, not having time to erect tents, etc. On such occasions the Campas would light their fires as near us as possible—generally only a few yards away. Rifles, watches, cutlasses, etc., would be scattered about everywhere. These would be curiously examined by the Indians, but everything put back exactly as it was found. We were always sure that nothing would be stolen. We had not, however, the same certainty of getting much sleep, for these people talked and make a noise all night. Cooking fish, and perhaps boiling water in some old tin, they would sneak off with our tea-pots and pour hot water through them, making believe to drink tea as they had seen us do—tea being a beverage unknown to them. No sooner did one set get tired and lie down than others would stretch themselves and take their place, to repeat the previous operations on fish and yams. Truly, as Kintsokeri said, they "eat when they are hungry," but their appetites are insatiable.

They are indeed like children. One of them puts an empty tin can on his head and marches past. This is sufficient to call forth the most excessive merriment amongst the others, and furnishes a theme for prolonged discussion and laughter.

For some time I occupied a tent along with three companions. One night, awaking and feeling cold, I found that I had kicked off all my bed-clothes, and that it was raining hard. Also it seemed that some one was moving about the tent. On striking a light, I found that some dozen Campas had taken refuge inside from the rain; and this is how they were passing the time:—One was testing my companion's tooth-brush, as he had seen it used; another was smoking my pipe; a third had his head and face covered with a lather of soap (to them an unknown luxury); while a fourth gentleman was fast asleep on the ground, comfortably rolled up in my bed-clothes. The rest were all prying about, trying on boots and clothes, and anything else they could find. This business was being carried on amidst suppressed mirth, which was given full vent to on the light being struck, while from all sides came their everlasting salutation of *Añi*! *Añi*! (Friend! Friend!). Now, what can one do with an incorrigible people like this? They certainly mean no harm, but, as I have before hinted, respect of persons is altogether wanting in the mental constitution of the Campa. To kick them out would be, to say the least of it, injudicious. They are numerous, and not of a character likely to submit tamely to such an insult. I soon had my bed-clothes again, however; but no more sleep that night.

The food of the Campas consists chiefly of fish and yams. They hunt with bows and arrows, and are experts in the use of these weapons. I think, however, that they practise their use rather in the event of war than for the chase. Their closed-in, thickly wooded valleys scarcely offer the same facilities for sport as the open prairie lands of other Indians. They have neither horses nor oxen. The yam, which they cultivate and which also grows wild, we found to be a particularly useful vegetable. It is the root of a shrub, and weighs from two to twenty pounds. The ways in which it may be prepared are almost infinite. In every Campa house you are sure to find a large bowl of boiled yams. It appears customary for people to enter any house indiscriminately and help themselves, even in the absence of the owner. The yam is a succulent and undoubtedly most nourishing food. At any rate, along with fish from the river, it has built up this healthy, hardy, and honest race.

On festive occasions the Campa drinks a kind of cider made from the inevitable yam. Liquors of any other kind he does not know—a matter which will doubtless be remedied on the advent of the white man and his civilisation. When under the influence of his yam-cider, the Campa is about as pleasant as his European brother-savage in a similar condition. The Campas, however, are certainly not a drunken race—not at all to be compared with the Indians of the cordillera; and few greater insults can be offered them than to mistake them for, or confuse them with, those Indians.

Our Campas were remunerated for their services as raftsmen, etc., not in money, but in articles of merchandise, such as clothes, clearing-choppers, candy, penny mouth-organs, and the like. The acquisition of Campa curiosities can also only be effected by a similar method of barter. They are absolutely ignorant of the use of money, and would much prefer a small looking-glass to a sovereign or a five-pound note. It is well, how-

ever, not to give any of these people more than one thing of the same kind; because, should a Campa find himself in possession of, let us say, two axes, he will certainly either give one of them to the first axe-less companion he meets, or throw it into the river. He reasons simply that he can only use one axe, so why be burdened with two?

The *Caucheros*, or india-rubber merchants, who visit these parts, take a very unfair advantage of this simplicity. Composed of all nationalities (English excepted), these Caucheros bear no very good name. Italians, Spaniards, and Peruvians predominate amongst them. Their method of operation, as related to me by a Peruvian who had formerly been one, is somewhat as follows:—They arrive with a stock of gaudy, trashy merchandise. This is spread out before the admiring Campa, who, with an eye to barter, goes to the woods in search of india-rubber. In making the exchange, which of course is a mere farce, the merchant is careful to explain that the Indian remains in his debt, having received more than value for his gum. Now, whatever might be the conduct of a more enlightened person who found himself in such a position, the natural honesty of the Campa will invariably drive him to the woods for sufficient gum to free himself, a fact which the Cauchero is very well aware of and trades upon. In the meantime the rubbishy toys get destroyed, and the poor Campa will work for sufficient gum to buy more. The process is repeated by the Cauchero *ad infinitum*, until at last the Campa becomes practically a mere slave in his hands. Besides this, as there are many desperate characters among these Caucheros, and all are well armed, acts of violence and bloodshed are by no means uncommon.

As far as we went, I saw no rubber-gum on the Perené; but only a few years back a brisk business was done on an adjacent river, the Pichis. The patience of the Indians, however, is not without limits. They would not commit an act of dishonesty, but on one occasion they rose and massacred the Caucheros to a man, thus cancelling all debts. There is still plenty of india-rubber about that river, but no one seems to want it now.

Some fifty miles down the Perené river, we were told by Indians returning from below that it would be safer for us not to proceed farther. It appeared that a certain Campa chief, Kintsuay, was on the war-path. The name Kintsuay apparently inspired our Campas with something more than mere interest. We learned that a number of Chunchos (but whether Campas or not I could not make out) had forced two of this chief's friends, or dependants, to steer their raft over the cascades farther down, and that neither raft nor men had ever been seen again. In revenge, Kintsuay had already killed four of the other party. He appeared to be an object of terror to the men on the river. Many of his own countrymen had already fallen victims to his wrath, but he had not confined his attentions to them. When a younger man he had defied La Merced, and there, backed by a body of braves, had slain more than one European. When enraged, as we were told he was now, this Indian was extremely dangerous; and our Chunchos scarcely cared to pass his abode, from which they would very likely be greeted by a shower of rotating arrows.

Although a small party, we were well armed, and decided to proceed. Happily, as it turned out, there was no necessity for violence of any kind.

Kintsuay has chosen a good position for his dwelling. Situated on a small flat, some thirty feet above the river, it is hemmed in on all sides by precipitous hills. This is, therefore, a point difficult to pass except by the river, and the part of the channel suited for rafting runs directly under the house. On our approach the redoubtable chief was observed eyeing us from the bank, which rises perpendicularly from the river. In appearance he does not differ much from the other Chunchos, except, perhaps, that he is of an exceptionally massive build for an Indian. But I have never observed in the face of any Indian, or indeed of any one else, such a fierce expression or such an evil eye. He is a man whose figure indicates great strength—broad shoulders, wide chest, and legs slightly bowed. His head is uncommonly large and surmounted by a mass of long, shaggy black hair. He has the large coarse mouth common to many of the Campas; and in his fleshy nose the curve popularly ascribed to the Indian proboscis is inverted. Behind him stood a young Campa, tall and muscular, naked, and with his body painted red. We could also see others in the background in the same simple costume.

As Kintsuay scowled on us, he looked the very embodiment of malignity. He stood thus only for a minute, evidently taking our measure and making his plans accordingly. Then he assumed an air of unsurpassable joviality and jolly-good-fellowship as he hurried down to welcome us. He shook hands all round, embraced us in an almost fraternal manner, and escorted us up to his house, so delighted was he to meet us at last. We did not leave our weapons behind. Our own Campas followed; but there was a marked absence of that gaiety and laughter which characterised most of their proceedings. They mostly wore black looks and appeared sullen, as if little relishing the new company. The behaviour of one lad, a bow raftsman, was very noticeable. Usually the most talkative and volatile of all, he kept close by me now, and was quiet and douce enough up at Castle Kintsuay. He seemed overcome with fear, although I have seen his fingers crushed by a raft, and the nails torn off, without his uttering the slightest expression of pain. Neither did the older Indians seem to be on terms of much friendship with the warriors who hung about the place. The number of bows and arrows lying about carelessly, but in readiness, was also significant.

The house was of the usual Campa type. A number of poles are set up, and on them a roof of cane and thatch. Half-way up the poles a floor is formed of cane, where the Indian can sleep comparatively safe from troublesome insects and snakes, the roof protecting him from rain. The house is open all round the sides.

Kintsuay himself bustled about, spreading mats for seats, and helping us to yams and cider. On being questioned as to the truth of the threatening language we had heard of his using towards us, he seemed cut up beyond measure. "He had been slandered;" "we misunderstood," and so on. It would be difficult indeed to describe the hurt and distressed look which came over the face of this hypocritical, treacherous, lying old villain.

To show his good faith, he volunteered to accompany us on our expedition, and he actually did appear in camp next morning, accompanied by his long henchman, where he hovered about all day like a bird of evil omen. He went off at night, after which I saw him no more. During his stay in camp, whenever he joined a band of our Campas, their noise and talk ceased; and he would sit watching them, apparently enjoying their discomfort. He had a quick, suspicious way of moving his head about, and seemed ever on the alert. A slight incident which occurred at his house brought out the state of his conscience pretty clearly. He was talking to some two or three of us, beaming on us and making humorous remarks, which, however, we did not understand, when one of our party, a little distance off and unseen by Kintsuay, either for mischief or amusement, fired off a carbine. The Indian sprang up as if he himself had been shot; and although he caught us laughing, it was a minute or two before he could master his nerves and dismiss the terrified expression which had come over his face. We had also an example of the tyranny exercised by this chief on the river. A number of Chunchos, strangers to us, with some half-dozen rafts, came punting up the stream. Thinking to take advantage of Kintsuay's being occupied with us, they endeavoured to pass unobserved on the off side. The quick eye of the Campa chief, however, detected them. Rushing down the bank, his features distorted with rage, he dashed into the water up to the middle, and roared out some orders. Even those who were well past the house allowed their rafts to drift down. Their cargoes were examined, and they were ordered to back and pass by the channel under the house, which they all very humbly did.

It will be seen that the Campas are a simple, honest, brave, conscientious, and contented people; but there is one dark blot on the page of their history, which I have already referred to, and which, it is to be hoped, will soon be removed—namely, their belief in witchcraft and its consequences. *Matsi*, or son of a devil, is the most opprobrious name known to the Campa.

Should a child die, the father at once betakes himself to a sage, who indicates to him the person—the witch or warlock—who has caused the death. The culprit selected is almost invariably a young girl or woman—always one destitute of powerful friends. Strangulation, in some cases preceded by torture to extort confession, is the punishment. The "witch" is sometimes more mercifully thrown alive into a rapid, where death is probably nearly instantaneous. Or suppose a man fall ill: then his relatives seek advice as to the author of the sickness. The innocent victim chosen will be tied up and put to the torture, which will be increased or diminished as the patient's state gets worse or better. Should the sick man die, the sentence on the supposed witch may be that her head be cut off with a blunt knife and her body mutilated and cast into the river.

One case came to our knowledge as having occurred when we were in the country. The father of a child who had died, for whose death a "witch" had been disposed of, came to work as a raftsman with us, and was one of the most useful and obliging. He was rather quiet and sad—

not for the death he had caused (for in that he probably thought he had done only right), but for the loss of his child. The priests told me that he was a most inveterate scoffer, and was known to have taken an active part in the massacre of the Caucheros before mentioned.

Less fuss is made over the death of a woman; still, it may be said generally that one death among the Campas is followed by another. This must soon lead to the extinction of a people even now receding before the approach of the white man and his disastrous influence. Such practices are truly horrible; still, before condemning these savages too harshly, it will be well to remember how few years it is since every European nation was guilty of similar barbarities.

For ages the Campa has defeated in battle all the neighbouring tribes; and he is proud of it—too proud, perhaps, to mix with the Whites, when these shall enter his country, and to be treated as an outcast and "an Indian." Until now, wherever he has been thrown in contact with so-called civilisation, he has generally been cheated and taught infamy. But, were it only to remove such beliefs as those I have mentioned, the civilising element is imperative: in any case it is inevitable sooner or later, although its effects may not be all for good among a people at present truthful, honest, and brave, among whom crime is little known, unless we class as crimes acts committed under the influence of superstitious fanaticism.

THE GREAT BARRIER REEF OF AUSTRALIA.[1]

Mr. Saville-Kent may well be proud of the grand work in which he has described the most colossal of coral edifices—the Great Barrier Reef of Australia. Through the prudent liberality of the Queensland Government, he has been enabled to spend years in close study of the reef; the result, or part of the result, is this sumptuous volume, full of vivid description, and illustrated with numerous very beautiful photo-mezzotype plates, which give for the first time to the miserable untravelled a detailed picture of what a coral reef really is. We find it difficult to express our appreciation of the careful labour which this book represents, or to praise adequately the art of the photographs. In regard to work which mirrors Nature so well, what can one do but admire? Let us, however, attempt to give some glimpse into the portly volume's contents.

General.—The Great Barrier Reef was first made known to the curious by the explorations of Captain Cook, who opened up the Indo-Australian highway known as the "Inner Route." Following Cook came Flinders, King, and Bligh, and thereafter a systematic survey was made by the *Fly and Bramble*, with F. P. Blackwood as captain, and J. Beete Jukes as naturalist. But none of these had opportunities for close acquaintance

[1] *The Great Barrier Reef of Australia: its Products and Potentialities.* By W. Saville-Kent, F.L.S., F.Z.S., F.I.Inst. With a Chart; 48 Photo-Mezzotype Plates; 16 Chromo Plates; and many Woodcuts. Pp. xvii + 387. 4to. London: W. H. Allen and Co., 1893. Price £4, 4s.

with the reef so favourable as those which Mr. Saville-Kent has enjoyed.

The reef extends along the coast of Queensland for no less than 1250 miles, from the Torres Straits in the north to Lady Elliot Island in the south. Its distance from the mainland varies greatly,—from close proximity to 10, 30, 60, or even 150 miles. The whole area enclosed cannot be less than 80,000 square geographical miles,—a vast archipelago of islands and submerged or partially exposed reefs, bordered oceanwards by the chain of more or less detached reefs which we call the Barrier. This chain is broken by over a score of navigable passages, nine of which are regularly used, but it is complete enough to form "a natural breakwater against the ever reverberating surges of the Pacific Ocean, and thus to convert the Inner Route into a relatively shallow and tranquil inland sea, which the largest ocean steamers traverse, for the greater part of the year, with open ports, and on an even keel." Efficient pilotage and a very perfect system of lighting and beaconing reduce the dangers of the intricate navigation to a minimum.

But the reef is more than a breakwater; it is a treasure-ground. "It is the most valuable possession of the colony," for raw material to the value of over £100,000 is obtained annually from the reefs and the intervening waters. The most valuable products are pearl-shells and pearls and the succulent trepangs, and these natural resources are capable of great development under the watchful eye of science and with the not less necessary aid of capital.

Moreover, the reef is the home of a rich fauna, whose peculiarities and inter-relations raise many of those problems which form the intellectual meat and drink of biologists. The problem of the corals themselves is one which we have been nibbling at for long.

Origin of the Reef.—We confess to some disappointment with the section of Mr. Saville-Kent's work which deals with the origin of the coral reef. The author gives a full and fair account of the opposing theories,[1] and is no partisan. Thus, when he points out that much of the reef is composed of coral *débris*, the result of storm-battering on the rapidly-growing outer side, he is corroborating a part of Dr. John Murray's theory, although his own conclusion is strongly in favour of the "subsidence theory" of Darwin. Like Jukes, he found no positive evidence of upheaval, and he admits that he has no direct evidence of subsidence. But he dissents vigorously from Dr. Murray's statement (1889) that "it seems impossible, with our present knowledge, to admit that atolls or barrier reefs have *ever* been developed after the manner indicated by Mr. Darwin." According to Mr. Saville-Kent, "the Darwinian subsidence theory is by no means utterly defunct, and, from within the borders of the Great Barrier Reef and its environments, may yet receive the increment of direct evidence that is needed to rehabilitate it on a more substantial basis than that upon which it was originally founded."

This sounds hopeful, but what is Mr. Saville-Kent's argument? It is

[1] The author refers to the theory of Chamisso, which, we believe, was really due to Eschscholtz.

briefly this. All the few big breaches in the Barrier's outer rampart are opposite large estuaries; it is maintained that these openings were once in close proximity to the mouths of the rivers, and are due to the restraining influence of fresh water on coral growth. "The contention of Mr. Darwin and the supporters of the subsidence theory is that the initial condition of a barrier reef is a fringing reef, which, by the slow subsidence of its foundation, the upward growth of the coral masses, and the widening of the lagoon channel, becomes gradually separated from the land, and abuts externally against the deep water of the ocean." The breaches on the barrier-reef correspond with what would have been openings on a supposed original fringing reef, but further evidence of the supposed conversion of the fringing reef into a barrier-reef is necessary. Direct evidence is wanting. But to substantiate the assumption, "we resort to a magazine of ammunition that, whilst near at hand, has hitherto been unbroached." This magazine consists of the facts known in regard to the geographical distribution of animals. The fauna of New Guinea and of Tasmania resembles that of the Australian mainland in such a way that we are bound to conclude that there was once continuity. The continuity has been broken by subsidence, and thus we have proof that the subsidence necessary to convert the supposed fringing reef into a barrier-reef did really occur.

It will be welcome news to us to learn that the most colossal reef in the world, "which occupies a crucial position with relation to the controversy," affords proof of the correctness of Darwin's theory; but we humbly protest that Mr. Saville-Kent's conclusion is as yet a *non sequitur*. That the facts of geographical distribution prove an insulating subsidence does not prove that the Barrier Reef arose from a fringing reef by subsidence. But Dr. Murray may be safely left to defend himself, though it seems to us that Mr. Saville-Kent's argument will require strengthening before much defence is necessary.

We are also ungracious enough to be disappointed because the author has not helped us more towards an understanding of the physiology of corals. We wish to know what the polypes eat, at what rate they grow, how they make their carbonate of lime-shells, what the shell really means? There is also a lack of definite physiographical information. The size of the book led us to expect an ell of progress, but we are grateful for the yard. Perhaps the rest is in store. Indeed, the preface promises more to follow.

Corals and Coral Animals.—"The hard-dying, popular notion of an industrious coral insect that lived independently of the coral, and, with consummate skill and patience, built up the reef on the same principle as ants or bees construct their nests or waxen cells, has no foundation in fact." We trust that the notion is at last, in this age of enlightenment, *in articulo mortis*. For coral animals are simply polypes, like sea-anemones, dead-men's fingers, and zoophytes, whose skins form shells or skeletons usually calcareous. We ought also to be clear that the main mass of the reef is not a city of living corals, but rather a necropolis. "It is a sort of indurated concrete, built out of the broken-up and reconsolidated *débris* of coral-stocks, that have either undergone natural disintegration or have

been forcibly torn by storms from their original position on the reefs." The result may be a fine-grained hard limestone or a loose conglomerate bound together by fine calcareous cement. Shells of molluscs, echinoderms, crustaceans, and foraminifers, and the residue of calcareous algæ, known as corallines or nullipores, also form part of the stones and mortar of the edifice.

Corals, as we have noticed, do not form a class of animals; they are merely those Cœlenterates (popularly stinging animals), which have a more or less hard, and usually calcareous framework or shell. Thus there are corals of the hydroid or zoophyte type, viz., millepores; corals of the dead-men's fingers type, *e.g.*, organ-pipe coral; and, thirdly, corals of the sea-anemone type, *e.g.*, the madrepores, which are of most moment in reef-building. In working out the nomenclature and affinities of the Barrier Reef representatives of the sea-anemone-like corals, Mr. Saville-Kent has received substantial assistance from Professor A. C. Haddon, who lately explored the Torres Straits, and with whom the author has to a certain extent gone shares in Actinozoa. Mr. George Brook has also been working through the collection which the author presented to the British (Natural History) Museum. We do not propose to say anything about this part of the author's work, interesting as it is to ourselves; we recognise that an appreciation of the author's "finds" cannot be attained without labour. Yet there is a fascination about the giant sea-anemones (*Discosoma*) with discs 1 to 2 feet across, within whose bodies tiny perch-like fishes and brightly coloured prawns habitually find lodging and probably board. For ourselves, we confess that we have gained most from the author's truly wonderful monochrome illustrations of the living polypes, and of the natural appearance of their massed shells. As we gaze at these again and again, we almost begin to fancy that we have seen the real things. We echo the author's wish that the results here attained may lead biologists to a much more extensive adoption of photographic processes. Enlargements of the plates are obtainable from the publishers and lantern-slides of the same from Messrs. Newton & Co.

Pearls and Pearl-Shell Fisheries. — Pearl-shell (from *Meleagrina margaritifera*) is one of the most important exports of Queensland, as may be inferred from the fact that the average annual value of export for the five years 1884-88 was £69,000. There is room for great development, but there is also a demand for conservation, for we already hear of a diminution in the average weight, due to the depletion of the more accessible grounds. The law on the matter is that no shell with an external diameter less than 7 inches is legitimate capture. Shells weighing three or four pounds per pair are considered "fine," but giants weighing twice as much are procurable; the "very best" are quoted at £177, 10s. per ton, and "good shell" at £135. The industry has its head-quarters at Thursday Island, and is restricted to the tropical waters bathing the reefs. The average depth from which most of the shells are obtained is 7 to 8 fathoms. "Mainland aboriginals, South Sea Islanders, and natives from the Torres Straits Islands furnish most of the crews, while some of the best divers are represented by Manilla men, Chinese, Japanese, and Malays."

Some beautiful figures of precious pearls are given, and the author holds out some hope of experimentally increasing the frequency of their occurrence, for, as is well known, fine pearls are the elect among hundreds which are poor or worthless. As the result of experiment, Mr. Saville-Kent makes the important statement that "it may be confidently predicted that, if encouraged by favourable concessions and aided by skilled technical supervision and advice, the artificial cultivation of the mother-of-pearl shell, on a system akin to that applied to ordinary commercial oysters, will in the near future be a very important branch of the Queensland fisheries." This would remove from our appreciation of pearls the unpleasant association of moribund divers (for the molluscs no eater of oysters can feign compassion); and, at a time when we hear of the making of diamonds in the laboratory, it is interesting to hear of Mr. Saville-Kent's scheme for the growth of pearls on the shore.

Bêche-de Mer.—This title, a Frenchified version of *Bicho-do-mar* (worm or slug of the sea), is popularly applied to the edible sea-cucumbers or trepangs which are technically termed Holothuroids, and known to be relatives of sea-urchins, starfishes, and other Echinoderms. They do not look appetising, these slimy, sausage-shaped succulents—but they are caviare to the Chinese palate. The largest is *Stichopus vulgaris*, which fully extended may measure 4 feet in length, fairly long even for a sausage; but "Se-ok-um" (*Holothuria mammifera*) and "Hung-hur" (*Actinopyga obesa*) are the forms which fetch the highest prices in the Chinese market, selling at £100 to £150 per ton. Between 1881-1883 the value of the total trepang export from Queensland was about £30,000 per annum; thereafter the trade fell off somewhat, but is now improving, the exports in 1889 being valued at £22,740. Nine leading varieties are exported to the Flowery Land, but others are utilised as "judicious blends," and the author hints at further blending on the part of the Celestials. Professor F. Jeffrey Bell, of the British Museum, has worked up fourteen species from the author's reef collection.

The sea-cucumbers feed in great part on minute Foraminifera, which along with much sand they mop up on their tufted tentacles, thrusting these organs one after the other into the mouth. For the Chinese market they are boiled, gutted, dried in the sun, and smoked for twenty-four hours in smoke of red mangrove. Then they are like charred sausages about 6 inches in length, with little suggestion of their original beauty of colour or grace of feathery tentacles. "Bêche-de-mer soup, skilfully prepared, is regarded by connoisseurs as equal to turtle, and is already a favourite in the *menus* of the leading clubs and hotels in all the Australian capitals."

Oysters.—The oyster-fisheries of Queensland have an output valued at £8000 to £12,000 per annum, much less therefore than that of the trepangs. In Queensland the genuine article is the Rock-Oyster (*Ostrea glomerata*), but supplementary forms are already, and deservedly, in the market. They grow in very varied ways, on vast level banks, more or less uncovered at low water (and this is most profitable), on reefs, on rocks, and even on mangroves. So prolific is the oyster, and so abundant are suitable areas, that the artificial cultivation practised is very simple, but

the author has valuable advice to give in regard to the future. Among the natural enemies of the oyster the first place is given to a small whelk (*Urosalpinx preciæ*) which files through an adult shell in a few hours, but it is interesting to notice that that there is another Gasteropod (*Natica plumbea*) who bores the borer. But what if the Natica develop a taste for young oysters?

The author protests against the wholesale condemnation of starfishes as destroyers of the oysters, but he will not give them the benefit of his doubt. However this may be, it is foolish of the cultivators to tear the unjudged creature in pieces, and to throw these into the sea. For each arm can grow an entire starfish, and vengeance recoils on the foolish. "If only the lamb's tails docked by the Australian pastoralist could be induced to regrow the lamb . . . !" Many fishes, *e.g.*, Tetrodon, Diodon, sting-rays, and Port Jackson sharks, have a taste for oysters; crabs, birds, and boring sponges are also inimical. Moreover the insinuation of mud and the entrance of a small worm (*Leucodore ciliata*) along with the mud give rise to the mud-disease, the most fatal antagonist of that "flash of gustatory summer lightning" which supplies such a valuable stimulus to mankind.

Food and Fancy Fishes.—We do not suppose that Mr. Saville-Kent's humour lurks in the title "fancy-fishes," but that is the term one feels tempted to use after being dazzled with his coloured illustrations. We cannot help doubting the accuracy of some of the colours—such is our faith in nature's harmony—and some of the curves are such as we have never seen on any fish. But this is perhaps a gratuitous impertinence. We must remember that these gorgeous creatures should be seen in the brilliancy of their native haunts. It is possible that what seems incongruous in an isolated form may be harmonious with a complex environment. One must, at least, believe the author that the delineations fail to do justice to the marvellous hues of the living fish. "To stand up to your knees, or higher, in water, with a shoal of parrot fishes and other magnificent forms swimming round you, is an experience worthy of a journey to the Tropics." When the fishes are taken out of the water the colours vanish rapidly like bright dreams. Hence the value of the author's coloured plates. What Mr. Day described as yellowish, with dark or black bands, is resplendent in life with a livery of scarlet, black, and softer grays. Mr. Saville-Kent does not indulge in any interpretations of the brilliancy of the fishes and other animals which frequent the reef, and perhaps he is wise. In regard to fishes he notices their congruence with their surroundings, the sometimes marked divergence of males and females, some apparent mimetism, and the fact that many of the gorgeous forms are very good to eat. Queensland has a fish fauna of about 900 species, of which 300 are, more or less, edible. Of many of these food-fishes descriptions are given, but while these descriptions are interesting to read, they would be very tedious in summary.

Potentialities.—The potentialities of the Great Reef are many and various. Why import in so great quantities the sapid sardine? the author asks. Are not the young pilchards of Queensland waters as good as the sprats of Deal, branded in France? Shoals of fishes akin to

herring, mackerel, anchovy, pilchards, etc., waste their sweetness on the appetites of sharks; surely they are to be preferred to salted ling! But the ways of men are devious, and the crews of fishing fleets may be found feeding on salted imports whose counterparts abound in the waters. The fact is that labour is dear, and even Brisbane has not a fish-market. The arduously attempted acclimatisation of salmon in Queensland is not recommended, for why trouble with exotics, when the indigenous fishes are so good? Nay, more, "the indiscriminate distribution of imported brown trout in every accessible river in Tasmania has already exterminated from many of them a most excellent native grayling (*Prototroctes maræna*), which, both for the table and for the capital sport it yields to the fly-fisher, is held in high repute." Much—but not in this way—might be done in regard to fishes.

Then there are oysters in a profusion which, with due care, might serve for all the world. With ocean greyhounds and perfected refrigerators, we may expect to see, some day soon, Queensland oysters in prime condition in the London market. The author seems also to feel that too many of the pearl-bearers are being left unrobbed of their jewels, and surely, at this time especially, the enormous potential revenue which these represent is worthy of being considered. In the Bêche-de-mer fisheries there are also great potentialities. The edible turtle (*Chelone mydas*) abounds, and is often caught by the Torres Strait natives by help of the sucking-fish (*Echeneis naucrates*) which they use as a living hook. Some other turtles, including the hawksbill, might be "cultivated" with success for the sake of their shells. Among the potentialities is included a capture of the sea-serpent, for this creature, known as the *Moha-Moha*, and apparently a huge long-necked Chelonian, seems to play hide-and-seek among the reefs. The interesting dugong, "of some existing and probably of a yet more considerable latent value," browses on the sea-grass of the reef-flats, and we are glad to hear that care is being taken to prevent its sharing the fate of its late lamented relative—Steller's Sea-Cow. A choice brand of the famous Palolo worm (*Palolo viridis*) seems also among the "potentialities" of the reef, and the sanguine author looks forward to "a diet of worms at the proposed Thursday Island Zoological Station, which shall be annually discussed by the Ministry of North Queensland, or at more remote intervals by the Federal Council, with all the dignity and decorum of a Greenwich whitebait dinner." Good toilet sponges, black coral for the Indian market, madrepores for the decorators, and problems unending for the biologists; these and many other "potentialities" are piled up in a manner so impressive that we ourselves would fain lift our anchors and sail for the Great Reef.

We cannot, of course, recommend this book as one which every household should possess, but it is one which all who can afford precious and beautiful books should find it their duty to purchase. The work of the publisher is worthy of the author's. All that we have to suggest is that there should be a second volume, for there is much more to be told, and that it should not be bound in whiteness so fair that every consultation is registered on the cover. But this is a trifle. J. A. T.

THE TEACHING OF GEOGRAPHY IN GERMANY.[1]

THOUGH Geography has been handed down from Classic times as an integral branch of learning, it has been the last to be recognised in the higher educational institutions of Germany as an independent study. This has no doubt been due to its complex character, embracing, as it does, many subjects that have long been regarded as lying within the scope of closely allied sciences.

In the fifteenth and the beginning of the sixteenth centuries Cosmography, as Mathematical Geography was then called, was taught by Regiomontanus in Nuremberg (1471-1475), by Joh. Stöffler in Tübingen (1511-1531), by Peter Apian in Ingoldstadt (1527-1552), and by his son Philipp in Ingoldstadt and Tübingen (1552-1583); while the descriptive side was taken up by the Italian Camers, the Swiss Vadian, Conrad Celtes, and others. Sebastian Münster, the versatile pupil of Stöffler, who was professor of Hebrew at Basel from 1531 to 1552, endeavoured to combine these two branches, but the attempt was crushed in his *Cosmography* by the introduction of irrelevant historical material.

During the second half of the sixteenth century these studies declined in the German schools, and sprang up in the Netherlands, under the influence, to a great extent, of the growing maritime power of that State. Here flourished Gerhard Mercator (*ob.* 1594), the founder of the new scientific Cartography; Philipp Clüver (*ob.* 1622), the founder of Historical Geography in its more restricted sense; and Bernhard Varenius (*ob.* 1650), the founder of Physical Geography.

In the next century the outlines of a physical study of the globe were laid down in France and England, and in Germany Geography sprang into new life in the hands of Tobias Mayer, Lowitz, and Michael Franz. The last (*ob.* 1761) held the first chair of Geography in Germany. Mayer, mathematician, astronomer, and physicist, exercised a lasting influence through the publication of his *Neue Erdbeschreibung*. After the Seven Years' War Geography, as a separate branch of learning, disappeared from the German schools. We have only to record the lectures of the historian, Ph. Gatterer, in Göttingen, and those of Kant in Königsberg.

But subsequently a new impetus was given to Physical Geography, which since the days of Varenius had languished from the lack of observations of nature, through the great circumnavigations of the world, which from Cook's time stimulated inquiry into scientific problems, and through the travels of men of science—among the Germans, Reinhold, Georg Foster, and Alexander von Humboldt. At that time were also laid the foundations of Biological Geography, though confined, in academical circles at any rate, to mankind, the pioneer in this line of research being J. Fr. Blumenbach of Göttingen. But though Humboldt's numerous researches gave a stimulus to the study of the globe in many different directions, it was not the physical but the historical side that gained

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[1] From an article by Professor H. Wagner, Corresponding Member of the Society, in *Die Deutschen Universitäten*.

academical recognition—historical in that wider sense, according to which the surface of the earth is regarded as a stage for the extension and development of civilisation under the control of geographical causes that it is sought to determine. Starting from the philosophical ideas of history prevalent at the time, Carl Ritter (1779-1859) endeavoured to reunite these several branches of Geography into a perfect whole, and in 1817 set forth his plan in the first volume of his *Erdkunde im Verhältniss zur Natur und zur Geschichte des Menschen, oder allgemeine vergleichende Geographie als sichere Grundlage des Studiums der physikalischen und historischen Wissenschaften.*

This work opened the doors of the universities to Geography, and caused Ritter himself to be appointed lecturer in Geography at the Military School and at the University of Berlin. At first the students held aloof from the new course, but soon Ritter's lectures, earnest, methodical, and imbued with philosophical ideas, began to exercise a great attraction on the educated class of Berlin. In 1825 he was duly inducted into a professorial chair, and continued to deliver his lectures before large audiences until his death, at the same time working at his voluminous *Erdkunde.* In his stupendous activity Ritter has never been equalled among academical geographers, and though he cannot be regarded as the creator of Scientific Geography—a title by which he was known in his time and among the circle of his historical pupils—he certainly deserves the credit of having created Academical Geography. His principal achievements were the amplification, and in part the construction, of a system of geographical nomenclature, the initiation of a comparative method of examining the forms of the earth's surface as a means of ascertaining their effects, and giving prominence to the relief of the ground at a time when maps scarcely gave any indication of this third dimension. The great majority, however, of his pupils and followers were most influenced by the historical side of his teaching; he regarded the investigation of the geographical factors of the development of civilisation, treated in connection with the history of nations, as the highest task of Geography, and it is chiefly due to Ritter that Geography became absorbed into the rank of historical studies. Numerous are the historians who were guided into the path of research by Ritter, but he founded no school of geographers, probably because, being the sole champion of an old and wide-extending science, he had no colleagues to keep him from one-sidedness. Closely occupied with his own work, he was unconscious of the revolution that was taking place around him in the sphere of Physical Geography. Under the influence of Humboldt and Buch geologists and meteorologists between 1820 and 1840 took this branch under their care, and so, when the natural science period approached, Ritter's modes of expression and demonstration were little understood.

Indeed, the interest in Scientific Geography was thrust aside by the rapid progress of discovery, and, therefore, at the time of Ritter's death (1859), no great need was felt for the development of academical geography. The Geographical Institute of Justus Perthes in Gotha, which had formed a school of scientific cartographers, was then in the height of its prosperity. But in the twenty years that intervened before

the new era set in, Geography was not entirely banished from the Universities. In Berlin J. E. Wappæus was appointed professor in 1854, and after Ritter's death Heinrich Kiepert became a prælector, but both applied themselves chiefly to literary work, and seldom lectured—Kiepert only on Ancient Geography. Carl Neumann (*ob.* 1880), on the other hand, after his appointment in 1863 to a chair of Ancient History and Geography in Breslau, renounced all literary work, and by his instructive and highly-finished lectures exercised a most important influence in that University.

As an increasing quantity of geographical material poured in through the discoveries that quickly followed one another in the four quarters of the globe, round the North Pole, and in the oceans, as well as through the development of allied sciences, especially Geology and Meteorology, the want of a large number of specialists to treat this material scientifically began to be felt. At the same time the teachers in the higher schools complained of the miserable state of geographical tuition compared to the additional facts recently acquired, and to the enormous development of traffic throughout the world. The cause of this inadequate instruction they considered to be the complete absence of any preparatory course for teachers of Geography, such as had long existed at the universities for other branches of education. Soon the justice of this view began to be recognised. The Kingdom of Saxony and the rising University of Leipzig led the way by establishing a professorship of Geography in 1891, electing to the post Oscar Peschel, who revived the connection of Geography with Natural Science. His short composition, *Neue Probleme der Vergleichenden Erdkunde*, produced an effect which has not yet faded away.

The war of 1870-71 had the result of promoting the advance of the new movement, at first, indeed, only in Prussia. Geography also profited by the changes introduced by the Department of Education with the help of more ample means. In 1873 a professor was appointed in Halle, and in 1874 the plan of appointing chairs of Geography in all the High Schools of Germany was adopted. Some delay was caused by the difficulty of finding suitable occupants for these posts. Within a few years, however, professors were appointed at Königsberg, Marburg, Bonn, Kiel, Greifswald, and Münster, and in 1885, in addition to Kiepert, who had already been promoted to a full professorship, F. v. Richthofen was inducted into a chair of Physical Geography. The other States, with the exception of Saxony, were long in following the example of Prussia, but now of the High Schools of Germany only in those of Rostock, Jena, Würzburg, Erlangen, Tübingen, and Heidelberg are endowed chairs still wanting. How great the progress has been may be judged from the facts that twelve ordinary and four extraordinary chairs have been established at these schools within the last twenty years, and that there are now twenty-eight professors and teachers at eighteen out of the twenty-one Universities of Germany.

Partly in consequence of this development, and partly owing to the complex nature of the science, there is at present little uniformity in the course of instruction, or to a certain extent in the work of the academi-

cal instructors. Most of the old pioneers are still at work, and can look back at fifteen to twenty years of experience. The majority have passed from the High Schools to the Universities, such as G. Gerland (Strasbourg), Alfr. Kirchhoff (Halle), R. Lehmann (Münster), J. Rein (Bonn), and Herm. Wagner (Göttingen). The last was also for many years engaged at the Geographical Institute in Gotha. Of the above Rein has had the advantage, through long sojourn abroad, of observing the culture of foreign lands, and, to a more limited extent, Th. Fischer (Marburg), and Ratzel (Leipzig); while scientific travellers are represented only by Richthofen and Pechuel-Lösche. The younger generation of teachers, however, especially Richthofen's pupils, have lately endeavoured to devote a few years to scientific journeys before entering on their academical duties.

Though in the above sketch of a transitional period many of the details are of a temporary character, a certain diversity will still remain in the scientific foundations on which teachers of Geography in Germany base their work; and this is a necessity, since the subject demands such a variety of scientific knowledge. Perhaps too few of the present teachers have been students of Mathematical Physics; the majority have passed from Geology or Biology to Geography, while the remainder have studied History and Philology. Naturally these conditions have affected the conceptions held at the German Universities respecting the aim and scope of geographical inquiry. There is no unanimity as regards them, but it is generally agreed that Geography is essentially a branch of Natural Science. The view, advocated by G. Gerland, that the physics of the globe are the sole field of Geography, has few adherents. Most geographers maintain the original duality of the subject—that its object is to investigate the effects of telluric phenomena on the distribution of mankind. Actually, indeed, the questions treated of in academical instruction and in literary productions have at present been connected with Natural Science, such as morphology of the earth's surface, oceanography, and climatology, though a group of specialists, with F. Ratzel at their head, have devoted their energies to the elucidation of the problems of anthropogeography. The scientific production in Germany during the last twenty years has been extraordinarily prolific, and it is not to be wondered at if the corrective of strict criticism has not kept pace with this rapid development. The elaboration of a rationalised system of Geography is in many directions hardly commenced.

The geographical courses are much the same in all the German Universities, as far as their outward forms are concerned. Where they extend over four or five half-yearly sessions, attention is given equally to the Geography of the globe and to that of particular countries. In the former, preference is given to the physical rather than to the mathematical, biological, or anthropogeographical sections. As regards the latter it is uncertain to what extent the various geographical points of view are brought into relief—but there is no doubt a great diversity in the modes of treatment. In marked contrast to the views prevailing in Ritter's time, geographical exercises (*Uebungen*) are regarded as indispensable adjuncts. They take the form dictated by the previous education, proclivities, etc., of the teacher. Certain forms, however, above all the introduction to

the planning and drawing of maps, which was formerly taught at very few Universities, are gaining ground. A peculiarity of the transitional period is that those teachers who have had practical experience are giving lectures and conducting exercises on the method of geographical teaching. At some of the High Schools also instruction is given in the taking of scientific observations, such as is needed by travellers, and the solution of geographical problems is associated with geological excursions.

We now come to the Geographical Institutes which have sprung up in modern times. In 1856 the Scharnhorst collection of maps was purchased by the State to form an independent public institute under the Professor of Geography, but it was afterwards annexed to the collection of the Royal Library. On the appointment of professors in 1874, however, the Prussian Government disbursed small sums for the purchase of teaching apparatus for the High Schools, and the other States did the same. From very small beginnings, fostered by the liberality of the boards of education, have in the course of time grown up those new University Institutes which Germany may regard with a certain degree of pride. At present they bear the name of "Geographical Institutes" only at a few of the High Schools; elsewhere they are called "Geographical Seminaries," "Laboratories," etc. But they are already great helps in furthering the advance of geographical studies, and have attracted much attention from foreigners. Though of a common origin they differ considerably in details, partly because each managing body has fitted them up according to its own predilections, and partly because some of these institutions have larger funds at their disposal than others. The Institutes at Berlin, Göttingen, Leipzig, and Strasbourg are the best furnished at present. The usual wall and hand maps, diagrams for lecture purposes, and libraries, are found in all. Göttingen has received an excellent collection of maps, comprising nearly 20,000 sheets, from the Royal Library; in Strasbourg there is a goodly number of instruments, such as are required in Cartography, as well as surveying and meteorological instruments, and a considerable collection of specimens illustrating the composition of the earth. (A survey of the equipments of the Institutes of Central Europe is published in Wagner's *Geographisches Jahrbuch*, 1890-91).

In conclusion, the great change must be noticed which has taken place in the audiences that assemble to hear geographical lectures. The professorships were established at a time when, among the administrative bodies, in schemes of education, and in the regulations for examinations, Geography was still regarded as the handmaid of History. Therefore, the audiences were chiefly composed of students of History and Philology, though here and there a student of Natural Science or Mathematics was to be found. Independently of the enormously increased attendance at the universities between 1875 and 1885, the geographical lectures attracted large and constantly increasing audiences, and many of the students exhibited real capacity for this branch of study. Therefore the geographical professors of Prussia joined in the efforts which were made to sever the obligatory combination of Geography and History in examinations. When this was effected, the consequence was a weeding of the

geographical lecture-rooms; historians and philologists turned away, while their places were filled by larger numbers of geologists, mathematicians, and physicists.

In spite of this alteration the teachers have still to contend with the difficulty that they have to deal with pupils of very varied attainments. But, as already remarked, such diversity is necessary for the education of a generation of workers in all departments of the science, and an examination of geographical dissertations reveals the encouraging fact that they gain in excellence, and while avoiding a stereotyped groove, are year by year increasing in scientific value. In the direction of literature, then, Geography will not long lag behind her sister sciences.

OBITUARY.

John Bartholomew.—On March 29th there passed away a noted Scottish cartographer whose work has done much to establish the reputation of Edinburgh as a centre of geographical education. The late Mr. John Bartholomew was born on December 25th, 1831. He early commenced to learn map-drawing and engraving under his father, and his love for that kind of work soon led him to make rapid progress as a cartographer. In 1853 he went to London as an assistant to the celebrated geographer, Dr. Petermann, from whom he no doubt acquired much of his enthusiasm for thoroughness and accuracy. His fellow-worker in those days was the now well-known authority on African cartography, Mr. E. G. Ravenstein. Returning to Edinburgh in 1856, he continued his father's business with great energy, and, in conjunction with Dr. Petermann, contributed most of the maps to *Fullarton's Royal Illustrated Atlas*, and, in conjunction with Professor Hughes, drew and engraved *Philip's Imperial Atlas*. He also drew and engraved numerous topographical and geographical maps for *Lizars' Edinburgh Atlas* and other works, and before the maps of the Ordnance Survey were available, produced the first plan of the city for the *Edinburgh Directory*. Other important works followed: *Black's General Atlas of the World*, a large topographical map of Scotland on the scale of 4 miles to an inch, and, afterwards, a companion map of England and Wales from the survey just then completed. The last-mentioned map was a heavy undertaking, which occupied many years, and, on completion, held out little or no prospect of financial success. These and other similar works were almost in advance of their time, and it was only in later years that any benefit was reaped. After this period, the production of maps was greatly developed by the introduction of lithographic printing. Maps for educational purposes could now be cheaply and quickly produced, and from this time Mr. Bartholomew was for many years specially engaged on school atlases and wall-maps for many geographical publishers, including Messrs. Nelson and Messrs. Chambers of Edinburgh, Messrs. Philip of Liverpool, and Messrs. Collins of Glasgow. These works attracted much public commendation, and received distinguished awards at different international exhibitions.

About 1870, as the business gradually extended, several important atlases were undertaken for American and foreign publishers: the *Handy General Atlas of the World* being published simultaneously in England and America. Mr. Bartholomew's special interest and work was, however, always more topographical than geographical. Numerous maps for many guide-books led to larger works of the same class, such as his well-known reduced Ordnance Survey Maps of Scotland and England on the scale of 2 miles to an inch, and his *Gazetteer of the British Isles*. In 1882 his son, Mr. J. G. Bartholomew, Hon. Secretary of the Royal Scottish Geographical Society, whom he had trained to his work, began to take an active part in the business, and many new modern atlases were published, and topographical maps were for the first time produced with contour lines coloured to show the height of the land. In 1889, on the occasion of leaving his premises at Chambers Street for the new Geographical Institute at Park Road, he retired from active work, leaving the management of his business to his son. Until weakened by failing health, Mr. Bartholomew's energy was wonderful. Even during the short holidays he allowed himself, his pockets were usually filled with maps, which he covered with notes and corrections by the way. His last publication was the large plan of his native city, on the scale of 15 inches to a mile, but he continued to work on his special topographical maps, and until a few weeks before his death was engaged preparing MS. copy for a new map of England on the scale of half-an-inch to the mile. Had Mr. Bartholomew's aim in life been the acquisition of money, he might easily have become a wealthier man, but his best work was mostly a labour of love, and the profit went to the publishers. During his lifetime he trained up many map draughtsmen and engravers who afterwards joined the various surveys maintained by Government at home and abroad. During the forty years of his active work he produced some thousands of map plates, from which some hundreds of millions of copies have been produced and dispersed over the world.

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

Lieutenant Peary.—The Secretary has received a letter, dated 25th May, from Lieutenant Peary, in which, after expressing regret at his inability to visit this country before his expedition starts, he says :—"My second expedition will start on schedule time, during the latter part of next month. I have already chartered my ship, the *Falcon*, a craft nearly twice the size of my former ship, the *Kite*. My party is, with one or two exceptions, selected, and everything is moving on as rapidly as incessant work can make it. . . .

"I hope in my next expedition to complete, once and for all, our knowledge of Greenland and its northern archipelago, north of the seventh parallel. When that is accomplished I shall feel that my work in the field is done, and I shall then take the greatest pleasure in telling the Royal Scottish Geographical Society, if desired, about the work."

World's Columbian Exposition at Chicago.—The Secretary has received the following letter from the National Geographic Society of Washington, D.C. :—

"The National Geographic Society of Washington and the American Geographical Society of New York will together conduct an International Conference in the interests of geographic science in connection with the World's Columbian Exposition at Chicago. The sessions will be held in the Columbus Hall of the Art Institute on Wabash Avenue, Chicago, on the 27th day of July 1893.

"The managers of the Conference will be pleased to have your Society represented by its delegates, and they extend a cordial invitation to all members of your Society, who may at that time be in this country, to attend these sessions. It is especially desired that those wishing to present papers to this Conference should communicate their intentions, with the titles of such papers, at the earliest possible date."

GEOGRAPHICAL NOTES.

By W. A. Taylor, M.A., F.R.S.E.,

Librarian, R.S.G.S.

EUROPE.

The Temperature of the North-East of Scotland.—In the *Journal of the Scottish Meteorological Society* (Third Series, No. ix.) Dr Buchan discusses the records of observations made at Gordon Castle, Aberdeen, Culloden, Hawkhill, and Mertoun, during the 129 years ending in 1892. Comparing the annual means for this period with those for the thirty-five years, 1856-90, it is found that the differences are very small. The temperature of the winter months—December, January, and February—shows the greatest difference, owing to the low temperatures which generally prevailed from 1798 to 1827, and the high temperatures occurring between 1828 and 1892. The mean excess is 1° in favour of the shorter period. The highest mean temperature of any single month was 65°·7, in July 1779, and the lowest 27°, in January 1814, the difference being 38°·7. The coldest year since temperature began to be observed in Scotland was 1782, when four of the lowest mean monthly temperatures were recorded. The mean temperature was above the normal in every one of the twelve months in the years 1828, 1834, and 1857, and in eleven months of the years 1779 and 1781. On the other hand, the means were below the normal in all the months of 1789, 1799, 1816, and 1879, and in eleven months of 1838, 1860, and 1892, the weather of these seven years being peculiarly disastrous to crops. The warmest seasons during the 129 years were the winter of 1778-9, 5°·8 above the normal; the spring of 1779, 4°; the summer of 1779, 6°·1; and the autumn of 1818, 3°·1. The coldest seasons were the winter of 1878-9, 4°·8 under the normal; the spring of 1782, 6°·7; the summer of 1782, 3°·6; and the autumn of 1782, 5°·1. The highest mean annual temperature, 50°·1, occurred in 1779, and the lowest, 42°·1, three years later, in 1782, the difference being 8°.

Dr. Buchan has examined the observations with a view to discover whether any cycle of temperature exists. For this purpose he divided the period into groups of 5, 10, 11, 15, 20, 22, 25, 30, 33, 40, 44, 50, 55, 66, 77, 88, and 99 years. Wide differences are exhibited between months of the same season. Thus, the temperature of January was generally below, and that of December above, the normal during the years 1766 to 1786, while from 1862 to 1892 the temperature of January was decidedly above the mean, and that of December during the period 1869 to 1892 below it. The thirty-three years' periods of mean annual temperature, comprising 97 groups, are of considerable interest. The first eight commenced with a

temperature of ·2° above the normal, and terminated with the normal temperature; the following 41 groups were under the normal, the maximum difference being ·8°, and that of the last group, ·1°; the next 41 were above the normal, rising to a maximum of ·6° and ending with ·1°; and the last six did not vary from the normal by more than plus or minus ·1°. It may be remarked that, considering the general prevalence of low temperatures during the past twenty-two years, it is certain that a thirty-three years' period of means under the normal has just set in. For groups of periods of more than thirty-three years the results are much the same, but the divergence from the normal decreases as the number of years taken increases. Dr. Buchan concludes from his examination of all the periods that, with the single doubtful example of mean annual temperature deduced from long periods, there is no evidence of a recurring temperature cycle.

The low temperatures in the Januarys towards the end of last century, and the high temperatures in the Decembers, may be explained by the fact that during those years most of the cyclones and other systems of low pressure passed to the north of Scotland in December and to the south of it in January. Here we have the disturbing element in the climate of the British Isles which tends to render indistinct or to obliterate all traces of temperature cycles, if such exist.

Sunshine on Ben Nevis.—Mr. R. C. Mossman, F.R.S.E., having compared the sunshine records of Ben Nevis Observatory, commenced in 1884, with those collected from forty-six stations by the Meteorological Office (see vol. viii. p. 322), states that during March to October inclusive the mountain observatory had the least sunshine of any station. Spring is, on the whole, the sunniest season on Ben Nevis, in consequence of the dry easterly winds which then blow so frequently. Of the months, June, which has of late years been very fine on the summit, is the sunniest, with 26 per cent. of the total amount possible. In July only 14 per cent. was recorded, while in August the nine years' average was only 11 per cent. This month is the dullest in the year after November, December, and January, and not only on Ben Nevis, but generally over the north-west of Scotland and Ireland, whereas in Jersey the highest percentage of the year, 55, was recorded in this month. This occurrence has been explained by Messrs. Omond and Rankin (*Trans. Roy. Soc. Edin.*, vol. xxxvi. part 2) by the fact that during August a diminution of 33 per cent. below the mean of the year has been observed in the easterly winds, and an increase of 14 per cent. in the westerly winds, which are productive of cloud. In August 1889 and January 1890, only 2 per cent. of the possible sunshine was recorded, while in June 1888 Ben Nevis was the sunniest station in the British Isles, with 250 hours of bright sunshine, or 47 per cent. of the possible. It appeared that it was fine on the summit when the mountain happened to be at the centre of an anti-cyclone, a layer of clouds often lying at such times between the summit and the base.

The sunniest hours are 11 a.m. to 2 p.m. in spring; 9 a.m. to noon in summer; and 10 a.m. to 1 p.m. in autumn and winter. During late spring and early summer the maximum occurred in the forenoon, and a secondary maximum late in the afternoon. The diminution about noon is due to ascending air-currents, which bring up moisture from the surrounding glens to be condensed into cloud on the cold slopes of the mountain. And to this cause must be ascribed the small percentage, 16, recorded in May, which is the sunniest month in the year at all other stations except those in the extreme south of Great Britain, for in this month there is a considerable quantity of snow on the summit, which acts as a powerful condenser. During autumn and winter the greatest amount of sunshine is recorded at the time of maximum temperature.

Since July 1890 sunshine has been observed at Fort William, and a comparison shows that the high-level station received one-third less sunshine than the lower, and had exactly double the number of sunless days. In the months of February, November, and December 1891, the summit had more sunshine than the base, while in the Julys and Augusts of the three years the sunshine recorded at the summit was barely half that at the base, and the number of sunless days four times as great. The period of comparison is, however, too short for satisfactory results.

The Lake of Constance.—At the Geographical Congress held in Stuttgart, Count Zeppelin made a report on the exploration of the Lake of Constance, now commenced by the riveraine States. Several thousand soundings, systematically distributed, have proved that a zone runs along the shore, descending to a depth of about 30 feet, and surrounding a deeper depression with a flat bottom and steep flanks. The deepest *Schweb* (the local name for the flat lake bottom), occupies one-third of the area, and lies only slightly below the other two, so that large areas are included between successive contours. The subaqueous channel of the Rhine can be traced for a distance of 5 miles and a furlong, to the *Schweb* of Langenargen. It is 440 to 650 yards broad, and its bottom lies between steep banks which rise to within 230 feet of the surface, and has a fall of 2·4 per cent. A similar channel running from the village of Altenrhein to the Rorschacher *Schweb* gives a simple interpretation of the name of the village. Glacial action has, according to Count Zeppelin, had little share in the excavation of the Lake of Constance proper. The bottom is composed chiefly of debritus, and only near Meersburg are rocks found *in situ*. From this place a ridge, which may be an old terminal moraine, runs north-westwards to Mainau, cutting off the Ueberlingen lake. Perhaps it extends to Constance, shutting off the Untersee. The shore zone varies in breadth up to 1¼ miles, and here are found remains of old moraines, the lighter parts of which have been washed away. The Untersee, which may be said to terminate at Stiegen, consists of three separate basins. Here, too, the dividing ridges are probably of glacial origin. Other soundings in this lake will be found in vol. vi. p. 602. —*Globus*, No. 20.

Area of the Kingdom of Italy.—The area obtained from measurements of old maps of the kingdom was 114,410 square miles, but it has long been known that this calculation was incorrect. General Strelbitsky, of the Russian General Staff, in his measurements of the areas of the States of Europe, gave the area of Italy as about 300 sq. miles less than the above. It was then decided that the Istituto Geografico Militare should execute a planimetric measurement, and the results show that the area of continental Italy and the adjacent small islands is 91,417 sq. miles, that of Sicily 9938, and that of Sardinia 9296, giving a total area of 110,651 square miles. The Istituto has already commenced the measurements of the individual regions and provinces, but some years must elapse before the work is finished. Only the areas of Liguria, Calabria, and Sicily, and of the provinces of Alessandria, Cuneo, Caserta, and Naples have at present been determined. Meanwhile the Statistical Bureau has carried out planimetric measurements of the same portions of the kingdom on G. Fritzsche's *Carta Political Speciale del Regno d'Italia*, published by the Istituto Cartografico, on the scale 1 : 500,000. The differences between the two sets of calculations are less than 2 per 1000.—*Boll. della Soc. Geogr. Italiana*, April 1893.

The "Pola" in the Mediterranean.—Short notices of the work accomplished by this expedition have already appeared in vol. vii. p. 672 and vol. viii. p. 657. The vessel was sent out in 1890, 1891, and 1892, at the instance of the Akademie der

Wissenschaften in Vienna, and the results of the important observations made by the scientific staff have now been published. It has been shown that the deepest part of the Eastern Mediterranean is in the middle, and that depths as great as in many parts of the open ocean exist close up to the coasts of Sicily, Greece, Candia, and the plateau of Barka. The steepest slope was found off the island of Sapienza, near Navarino, where at a distance of only 10 nautical miles from the shore a sounding of 1722 fathoms was measured, whence it appears that the inclination is 10°. In the year 1887 the *Washington* sounded depths near the middle of the sea of 2217 to 2223 fathoms, but a sounding of the *Pola* about 180 miles further east, 54 miles to the south-west of Cape Matapan, amounted to 2405 fathoms. Between the soundings of these vessels runs a ridge, some 550 fathoms below the surface, in a north-westerly direction, apparently a continuation of the Barka plateau in Africa. Another rise of the bottom, with about 1100 fathoms of water above it, runs from the same plateau to the east of Candia, separating the *Pola* deep from the eastern depression. In the latter the greatest depth sounded was 1963 fathoms, 28 miles from Makri, on the coast of Asia Minor. Off the coast of Syria only four depths exceeding 1100 fathoms were discovered, and in the channel between Cyprus and Asia Minor only two over 550 fathoms.

1655 observations of temperature were made, relating only to the summer months when the *Pola* was sent on its cruises. The water is warmer in the eastern part of the sea than in the western. The temperature sinks rapidly down to about 50 fathoms, then more and more slowly, falling only about one degree Fahr. between 220 and 550 fathoms. Below this latter depth a constant temperature of 56° to 57° F. obtains down to the bottom. Doubtless the high temperature in the greater depths is due to the exclusion of the sea from participation in the deep oceanic circulation, the Straits of Gibraltar being narrow and shallow. To the same cause must be ascribed its high degree of salinity. The specific gravity of the water in the Eastern Mediterranean varies from 1·0290 to 1·0300 (reduced to 17·5° C.), corresponding to a salinity of 3·79 to 3·83 per cent. Its remarkable transparency has already been alluded to in one of the previous notes. The colour was also tested by comparison with a fixed scale of blue fluid, and it was noticed that the dark sea tint grew paler as the sun's altitude increased.—*Globus*, No. 15.

ASIA.

Chitral, the small independent state in the north-west of India, at the southern base of the Hindu-Kush, has been visited by the Hon. C. G. Bruce and Dr. Robertson. From Gilgit they marched in most inclement weather a distance of 200 miles over the Shandur Pass (12,250 feet high). The wind was high and the thermometer stood in the morning between 0° and 5° F. The land is in a most miserable state : three princes have followed one another in quick succession, pillage and bloodshed is unrestrained, and the people suffer from famine. The scenery is magnificent. The Turech Mir, a mountain about 25,000 feet in height, closes in the valley.—*Geogr. Journal*, No. 5.

Jadeite and Burmite in Upper Burma.—Amongst the minerals for which Burma has acquired a world-wide fame, says Dr. Fritz Noetling in the *Records of the Geol. Survey of India*, vol. xxvi. part 1, is a beautiful green stone called Jade, or sometimes Noble Serpentine, but determined by Mr. Mallet to be Jadeite. It appears to have been first mentioned in 1837 by Captain Hannay, and a more detailed description was given by Dr. Griffith, who was the first European to visit the mines. These mines lie rather more than 30 miles from Kamaing, and consist of two groups—quarry mines on the top of the hill, near the village of Tawmaw,

and river mines in the valley of the Uru, beginning near Sanka village. Tawmaw lies in lat. 25° 44′ N. and long. 96° 14′ E., and Sanka is about 6 miles farther east. The stone is found in connection with, and enclosed in, an eruptive rock closely resembling serpentine, which pierces strata of perhaps Lower, but more probably of Upper, Miocene age. Though of no value in Europe, jadeite fetches a high price among the Burmans and Chinese, who will give as much as 400 or 500 rupees for a small piece big enough to fit into a signet ring. If, then, the mines were properly worked, a large revenue might be derived from them. At present the stone is extracted by a disorderly crowd of Kachins, who break the rock by fire and spoil a great deal of the jadeite. The Kensi Tsawbwa claims the mines as his property and receives a royalty on all jadeite exported, and the difficulty of transferring them to better hands seems insurmountable. It is quite possible, however, that the stone may be found in other parts of Burma.

Following the suggestion of Dr. Otto Helm of Dantzig, Dr. Noetling has given the name of Burmite to the fossil resin of Burma, hitherto called amber, for it is totally different in chemical composition from any other known fossil resin, especially from that generally known as amber (succinite). This article, also mentioned by Captain Hannay and Dr. Griffith, is found in the Hukong valley, in lat. 26° 15′ and long. 90° 30′. The resin occurs in pockets irregularly distributed in a stratum of blue clay of Tertiary age. It is harder than amber, and is easy to cut and polish, but its colour is inferior to that of amber, and fissures filled with felspar spoil many of the pieces. Consequently, it is being driven out of the market by what is known as Indian, but is really Prussian, amber.

Cambodia.—Important works which have been in progress during the past twelve months will render the town of Pnom-Penh one of the finest in Indo-China. By a convention signed in 1889, King Norodom ceded his rights over the site and buildings of his capital to the French Government, in return for an annual subsidy. The town covers about 13,820 acres, excluding the Cambodian city proper. In order to remove the muddy pools scattered over this ground the Resident has commenced the construction of a semi-circular canal, communicating at its extremities with the Tonle Sap river, which will allow vessels to approach the centre of the town, as well as supply soil to fill up the marshes. It has in consequence been possible to lay out 4264 yards of new street across what was formerly pestilential ground.—*Revue Fr. et Exploration*, May 1st.

AFRICA.

Dr. Fleck's Journey to Lake Ngami.—This traveller has described the country through which he passed in the *Mitt. aus den Deutschen Schutzgebieten*, Bd. vi., Heft. i. On March 23, 1890, he reached Hoaseb on the Nosob. The chief, Andreas Lammert, who resides here, has only 1200 subjects living in a territory greater than Hereroland. He boasts that all kinds of game, from the jackal to the giraffe, are to be found in his country, but his people are so poor that they have to subsist on wild fruits. They do not cultivate the ground, and have few cattle, and hardly any sheep and goats. At Hoagaus (Huguis) Dr. Fleck crossed the Nosob, and soon entered a country where water was extremely scarce. Through Uji and Uke he came to Hututu (not Lehutitang, or Lehutitu, as it is named on maps), the residence of the supreme chief of the Kalahari Bechuana, Mapaar. This village usually lies on maps too much to the west. Thence Dr. Fleck travelled northwards through Ukwa and Ghansis to Lake Ngami. The Kalahari does not, he says, deserve the name of "Desert," for everywhere grow rich fine grass, green trees, and juicy shrubs. At the edge of the Kalahari, near Nosob, the clumps of trees and bushy acacias are

large and dense, while farther inland they are more spread out, and are confined to the tops of the sand dunes, the valleys between being covered by luxuriant grass. The ground is for the most part red sand, frequently giving place to limestone, which lies horizontally over the older rocks. When shafts are sunk in this limestone, which is seldom thicker than 10 feet, water is often found, as at Ukhe, Hututu, and other places, and were more of such borings executed, it is probable that there would not be such a scarcity of water as now prevails in the winter months. Exclusively on the calcareous soil grows a kind of *Bauhinia*, sending out slender runners for distance of 18 to 28 feet along the ground, with seeds as large as broad beans, which, when roasted, are quite eatable, though they have rather a bitter flavour. In their season they form almost the only food of the Bushmen. The juicy roots, resembling those of winter radish, and lying 6 to 9 feet below the surface, are also eaten. The natives are of the Bechuana tribe, and call themselves Bakalahari. They are tall, well-built men, but cunning and indolent. The work is left to the women, the men doing nothing more than sew tanned hides together for rugs. *Sorghum*, maize, water-melons, and gourds thrive splendidly, thanks to the frequent summer showers, and are all the people want. A few cattle also are kept. The Bushmen do not raise any crops, but subsist on wild fruits. They are weak, have thin bones, and prominent cheek-bones. They are dexterous and quick in removing the pulp from water-melons, which they use as a substitute for water. They are timid and shy, but trustworthy, and ready to render any service in return for a pipe of tobacco. In making ropes from the fibre of a kind of *Sanseviera*, and hats of straw or dry grass, they are great adepts, and they poison their arrows with oil obtained from a fly, or rather its larva.

At the hills to the south of the Nhabe (Ngami is the name in the Bushman language) the Kalahari ends. They run almost in a straight line from south-west to north-east, the general strike of the elevations of South Africa, and are covered with blocks of stone piled together in confusion, and overgrown with creeping plants and long, dry grass. At Boliwa (Bolebeng) Dr. Fleck came to the western end of the Ngami lake, here lined with a belt of reeds more than 3 miles broad. Large stretches of those reeds had been set on fire and were still burning. It was curious to see storks (*Leptoptilus crumenifer*) somewhat like mariboos, picking up roasted locusts. Like the pelican they possess an air apparatus under the skin. On the way to Kuka there are low hills covered with grass and reeds, fronded palms (*Phœnix reclinata*), and fan-palms (*Hyphæna ventricosa*), of small height, owing to the yearly fires. In the hands of Europeans the country would become a paradise both in beauty and fertility.

Crossing the Okovango, which rose to the pommel of his saddle, Dr. Fleck came to Nukanin, the village of the Bechuana chief Moremi. In general the character of the Bechuana is anything but exemplary ; they are crafty, sly, untruthful, lazy, heartless, and exceedingly immoral. Moremi's town lies farther up the Okovango than usually laid down on maps, near a bend in the river. It contains 15,000 inhabitants, who are still more indolent than the Bakalahari. The women till the fields with the assistance of the Bakowa, who are subject to the Bechuana. During the night great disturbances are made in the town by girls who come from all parts of the country to take a three-months' course of singing, dancing, and household duties. Muffled up and wearing masks and skirts of reeds, with long staves in their hands, they parade the streets in Indian file, singing, screaming, shouting, and stamping with the feet. The neighbourhood of the town has no natural beauty, and is not rendered more attractive by the presence of vultures, which act as scavengers. But near the river, the Botletle of the Bechuana, are picturesque groups of mimosa, and fine trees with large-leaved foliage, interlaced with many

creepers, which relieve the dark-green of the foliage by their brilliant flowers. The river consists at ordinary times of a series of basins 5 to 10 feet deep, and is begirt with broad belts of reeds and rows of trees. Outside these the land is covered with grass, and can be cultivated without artificial irrigation. The climate is not dangerous, even in summer, if proper precautions be taken, at any rate not to the same degree as the Zambesi basin.

Returning to the southern side of the lake, Dr. Fleck followed the shore to the eastern end, where, near the village of Mopatelu, the reeds leave an approach to the water open. Outside the reeds runs a strip of short grass, and beyond this thick thorn woods. In the reeds lurk hippopotamus, crocodile, and large snakes, while many wading birds disport themselves at the edge of the water—*Grus carunculatus*, *Phœnicopterus minor*, *Ardea cinerea*, *Ardea Goliath*, *Ibis religiosa*, and the pelican. Two kinds of fish are caught in the lakes and eaten by the Mopatelu Bechuana, who have migrated thither from Kuruman, but Moremi's people will not touch them. Dr. Fleck rode as far as Moremi's old residence, at the outlet of the river Suga from the lake, and found that the river was about 50 paces broad. His views regarding Lake Ngami have already been reported at page 264 of this volume. He believes that all the places where chalk is now found—Ghansis, Kameelpan, Korisi, Choain, and Muchumi were once covered by a large lake, of which the Ngami is the residue. Between Korisi and Muchumi he saw some large and very old monkey bread-fruit trees, a form that demands a more temperate climate, and he believes that the absence of young trees is due to the change of climate consequent on the disappearance of the water.

AMERICA.

The Coasts of the United States, according to recent measurements of the U.S. Hydrographic Office, have a total length of 90,826 miles, whereas if the sinuosities be disregarded, their length is only 10,390 miles. The most indented coast, the Atlantic, has a development of 36,470 miles, while the distance measured in a straight line is 1998 miles. In the Gulf of Mexico the lengths are 19,084 along the coast, and 1798 in a straight line; on the Pacific the corresponding figures are 8893 and 1800; and in Alaska 26,378 and 4796 respectively.—*La Geografia per Tutti*, April 30th.

The new Capital of Brazil.—The new Brazilian Constitution contains a proviso that a territory of 14,400 square kilomètres (about 5560 square miles) shall be delimited on the highlands of Brazil, and that a new Capital of the Republic shall be founded in it. The astronomer, Senhor L. Cruls, has been commissioned to carry out the survey, and since last autumn has been engaged in the work, assisted by a large staff. Up to the present 1200 miles of routes have been surveyed, the geographical positions of some thirty places determined, and the courses of twenty small streams laid down. The four angular points of the quadrilateral which is to contain the district have been fixed, the town of Goyaz, which is in telegraphic communication with Rio de Janeiro, serving as a basis. Two sides of the quadrilateral will lie along meridians, and the other two on parallels of latitude. Herr Ernst Ule, a naturalist, relates in *Petermann's Mitt.* his journey into this region. Starting from São Paolo on June 25th he travelled for two days by rail to the terminus Uberaba, a town of 10,000 inhabitants standing at an elevation of 2400 feet above sea-level. On June 29th the Commission, consisting of 18 members, set out from Uberaba and marched 300 miles to Meia-Ponte, and thence 125 miles farther to Formosa. The central plateau of Brazil lies at an elevation of 1650 to 3400 feet, rising still higher towards the north, the region the Commission has to

survey. The country consists of gently undulating tablelands, called here *Chapadões*, thinly covered with stunted knotty trees, or more frequently with grass and herbs. In the valleys were seen a few woods which had suffered severely from frost. The country is extremely thinly populated, and the people are indolent and poverty-stricken. From Formosa, Herr Ule accompanied a small detachment sent out to survey some plateaus to the north, which were said to be over 6700 feet high. The route ran along the watershed between the Maranhão and Paraná over plateaus 3300 to 4600 feet above sea-level. Crossing the Tocantins, the party entered more mountainous country, and could see in the distance the Serra dos Viadeiros. On the tenth day the goal of the expedition was reached, a little to the south of Cavalcanti, and it was found that the highest *Campos* were only 5250 above sea-level, while a mountain near the camp was 5580 feet, and others were estimated at 5900. Exact observations have shown that the positions of places have been given incorrectly on maps. As regards the Serra dos Pyreneos, which rises above Meia-Ponte, Herr Ule states that it is not 9800, but only 4500, feet high. On the return, the party took a more westerly route, crossing the Rio Preto, the Tocantins, and the Bagagem (?), and passing the towns of São José and Trahiras, which once derived great wealth from gold and diamond mines, but are now in a state of decay owing to the indolence of the inhabitants.

The climate of this region is on the whole healthy for Europeans, but a capital in such a position cannot be expected to attain any importance, and whether it will ever spring into existence at all may well be doubted.—*Petermann's Mitt.* Bd. xxxix. No. 4, and *Mitth. der k. k. Geogr. Gesell., in Wien*, Bd. xxxvi. No. 4.

Jamaica.—*The Colonies and India*, April 1st, recapitulates the most interesting particulars communicated in Sir Henry Blake's last official report. The island contains about 2,683,000 acres, of which about 413,000 are flat and the remainder hilly. There are 640,000 acres, or about one-fourth of the whole, under cultivation, but of these 372,000 are merely common pasture. Along the centre of the island run ranges of hills, which attain an elevation of 1800 feet in the west and 7500 feet in the east. There is a great variety of soil and climate, and nearly every tropical product can be grown, as well as many crops of the temperate zone. The northern side of the island, being exposed to the north-east trade-wind, is several degrees cooler than the south, but cool breezes blow all round the coasts. The climate is healthy, though the average death-rate is 22·4 per 1000, for this is due to the mortality among Negro children, which is everywhere greater than among Europeans. The island contains several valuable mineral springs, among which are those at Bath, in St. Thomas-in-the-East, with a temperature of 126° F., and the Milk River Bath, in Clarendon, with a temperature of 92° F. They are very efficacious in cases of gout, rheumatism, etc. The exhibition of 1891 will, it is believed, have a most favourable influence on the industries of the island. Dairy-farming has been started, and has a great field before it, as the annual importation of butter is 720,000 lbs. Pottery works have also been established.

Exploration in the Amazons Valley.—Father Nicolino, a Brazilian, having found in a manuscript at Aix a description by Jesuit missionaries of vast plains lying to the south of the Tumuc-Humac mountains, set out in 1876 from the Lower Trombetas, a tributary of the Amazons, to reach this country. He obtained a view of the plains, but was obliged to return owing to lack of provisions, and on two subsequent excursions was not more fortunate. The Rio Trombetas seems to be formed by the confluence of two considerable systems flowing from the north-west and north-east respectively. The former was explored in 1885 by M. Condreau (see *S. G. M.*, vol. iv. p. 112), who reached it from the Rio Branco, an

affluent of the Rio Negro. In October 1890 an expedition under Senhor Tocantins, sent out by the Government of the Province of Para, ascended the Trombetas and entered its affluent, the Cuminã. The lower course of this river is obstructed by rocks and waterfalls, among which the canoes of the expedition were broken up. The party then marched through the forest and, having constructed a canoe, travelled for ten days along the Urucuriana, an affluent of the Cuminã, having frequently to cut away the huge trunks that had fallen across the stream. As fever broke out among them, they returned to the Cuminã, and at length, on November 28th, reached the sought-for plains. From an elevation rising 1300 feet above the river an extensive view was obtained. To the north grassy plains extended up to the Tumuc-Humac range, to the south the country was clothed with forests as far as the Amazons, and to the east the plains extended farther than the eye could reach—probably to the slopes whence the rivers flow down to the Atlantic. Westwards, also, no limit could be seen, and Senhor Tocantins believes that the plains stretch beyond the Rio Branco. The plateau is watered by numerous streams, and is studded with several treeless but grassy hills. Enormous herds of cattle might pasture here. The climate at the time of the visit of the expedition was temperate and apparently salubrious. At the farthest point reached the Cuminã was 820 feet wide and easily navigable. —*The Geographical Journal*, April.

NEW BOOKS.

The Aïnos. By DAVID MACRITCHIE. (Supplement to Vol. IV. of the *Archives Internationales d'Ethnographie.*) Leiden, 1892. With 19 Plates and 12 Text Illustrations.

This is a very valuable monograph on one of the most interesting of primitive peoples. The author has culled his information from many sources, and has put it together in a thoroughly impartial manner. After a comparison of the descriptions given by various travellers of the physical formation, the mental characteristics, and the customs of the Aïnos of to-day, Mr. MacRitchie devotes a considerable part of his work to the exposition of the plates, which are taken from Japanese sources. These are of the highest interest, and give the present monograph its unique value. In the portrayal of the Aïno figures not a little of the nationality of the artist appears. The attitudes suggest Japanese postures, while the Aïno countenance, especially in the women, is not always well caught. The artists trust almost wholly to the bushy beard, the heavy brows, and the tatooing as sufficiently discriminating. It may be safely said that the type depicted is more extreme than the average. Even modern artists are inclined to choose exaggerated types as good specimens. Moreover, the brilliant colouring in some of the pictures, notably in that reproduced in Plate XIX., hardly agrees with present-day appearances of an Aïno village and costume.

It is after a description of this picture that Mr. MacRitchie discusses the Aïnos in their ethnographic relations. The broad question calling for answer is this: Are the Aïnos the descendants of the pit-dwelling dwarfs, who appear alike in Japanese and Aïno legend? That the Aïnos at one time inhabited a large part of what is now Japan proper is unquestionable; but did a distinct and still more primitive race precede them? Into this question the author enters with judicial caution, quoting largely from Morse, Milne, Aston, Chamberlain, Batchelor, and others, who have made more or less positive statements on the point. His view is

that the Aïnos are mainly descended from the pit-dwelling dwarfs, and that their original anthropoid character has been greatly "modified by intermixture and by the influence of civilisation." "Similar earth-dwelling races, also remembered as pygmies, and equally distinguishable as anthropoids, are traceable over most of the world—notably in northern Europe." The "Aïno Inscriptions," which are considered in an appendix, can hardly be regarded as worthy of the name. No meaning has ever been made out of these rude markings, and the several theories as to their origin are little more than guesses.

In bringing together what is essential to a sound ethnographic study of this primitive race, Mr. MacRitchie has done an admirable piece of work. In the fulness of its references to authorities the book will be a valuable guide to those desirous of more detailed information; while the author's own discussion of the facts which he has so compactly welded together notably increases its scientific value. He has wisely abstained from any philological inquiries, language being, as is now recognised, an unsafe guide in matters ethnological. The manner in which the illustrations are reproduced merits the very highest praise.

Deep-Sea Sounding: A Brief Account of the Work done by U.S.S. "Enterprise," during the years 1883 *to* 1886. By Captain A. S. Barker, U.S.N. New York: John Wiley and Sons, 1892. Pp. iv+133.

This little book gives a running account of the circumnavigation of the globe by the U.S.S. *Enterprise*, during which a most excellent line of soundings was taken right round the world in the southern hemisphere. The introduction deals with the method of taking the soundings with wire rope, the same as used by the *Tuscarora* and other American ships. Chapter I. gives a description of the soundings and other operations of the ship in crossing the Atlantic from the United States to the Cape of Good Hope. Chapter II. deals in like manner with the soundings in the Indian Ocean; Chapter III. with a line of soundings from New Zealand to the Straits of Magellan; and Chapter IV. with soundings in the Atlantic between Monte Video and the coasts of the United States. The soundings and a few temperatures are arranged in tabular form at the end of the book, and there are three maps showing the positions and depths of the soundings in the Atlantic, Indian Ocean, and Pacific respectively.

Captain Barker speaks in enthusiastic terms of the British colonists at the Cape, in Australia, and New Zealand, and of the warm reception accorded to himself, his officers, and his crew. He looks forward hopefully to a time when there will be a union of all the English-speaking peoples of the world.

The *Enterprise* reached the Straits of Sunda about a week after the great volcanic eruption of the island of Krakatoa, and Captain Barker gives a very interesting account of the masses of floating pumice-stone, and of the destruction produced on land by the great earthquake wave.

By far the larger part of the book is, however, taken up with details of the deep-sea soundings, and these form in themselves a great addition to our knowledge of the bathymetry of the great ocean basins. The first remark that may be made with reference to these soundings of the *Enterprise* is that they confirm in almost every particular the views published by the *Challenger* Expedition with reference to the general configuration of the ocean basins. Of the 272 soundings taken beyond the continental line of 100 fathoms, the great majority have shown depths of between $2\frac{1}{2}$ and $3\frac{1}{2}$ miles. For instance, in the splendid line of 57 casts across the Southern Pacific, in latitudes of 45° to 50° S., 10 soundings were between 2 and $2\frac{1}{2}$ miles; 21 between $2\frac{1}{2}$ and 3 miles; 13 between 3 and $3\frac{1}{2}$ miles. The contour lines which have been published in the *Challenger* charts have

thus to be altered only in some slight degree, so as to be in conformity with these new discoveries of Captain Barker.

One other point is of interest. It has been stated in the *Challenger* publications that future soundings would in all probability show many conical mountains rising from the deep floor of the ocean up to various depths beneath its surface. Captain Barker's soundings reveal several of these—one in the South Atlantic to the west of Cape Town, with 731 fathoms on the top and over 2500 fathoms on either side, and another off the South American coast in the Atlantic, with 378 on the top and over 2000 fathoms on either side. In the Indian Ocean these new soundings indicate similar cone-like elevations, which are in all probability of volcanic origin, and in coral reef regions undoubtedly serve as foundations for coral atolls.

Captain Barker does not state whether or not the various samples of deep-sea deposits have been preserved, and are likely to be examined critically and described; they must be of very great interest. The names given by Captain Barker indicate, however, that in general they conform to what we already know of the distribution of deposits in the bed of the ocean at various depths and distances from continents and islands. In the greatest depths brown and yellow muds with black specks are noted, which are evidently the red clays with manganese peroxides of the *Challenger*. In shallower depths the fine white sand with shells is evidently the globigerina and pteropod oozes of the *Challenger*. The black and green muds near continents and islands are identical with the blue and green muds of the *Challenger's* terrigenous deposits.

It could have been wished that the records of deep-sea temperatures had been more numerous, but it must be remembered that the *Enterprise* was not specially fitted out for scientific work. She merely took these deep-sea soundings in addition to the ordinary work of the naval service. Captain Barker deserves all praise for the work he has done to increase oceanographical knowledge. It is a pity more men-of-war are not furnished with deep-sea sounding apparatus, and that more naval officers do not take an interest in this kind of work.

An Introduction to Geodetic Surveying. By Mansfield Merriman, Professor of Civil Engineering in Lehigh University. New York: John Wiley and Sons, 1892. Pp. 170.

Geodesy is the science of the Figure of the Earth, and this book is an introduction to the history and methods of that science, which has been written apparently for the instruction of a special class of students in the Lehigh University, America. It is not a complete treatise on geodesy, such as the valuable work by Col. Clarke, R.E., which was published at the Clarendon Press, Oxford, in 1880; but it does not profess to be more than a theoretical and practical introduction. It is divided into three parts:—I. The Figure of the Earth; II. The Principles of Least Squares; III. The Field Work of Triangulation.

The first part gives a chronological history of the speculations as to the shape of the earth—a cylinder, a cube, a sphere—by the ancient Greek philosophers, which is followed by accounts of the successive determinations, during the last two centuries, which made out the earth to be first a sphere; then a prolate spheroid, with its polar axis longer than its equatorial; then an oblate spheroid, with its polar axis shorter than the equatorial; and finally an ellipsoid, or figure with an elliptical equator as well as with elliptical meridians. But as the actual form does not precisely coincide with any simple geometrical figure, a chapter is devoted to the consideration of the earth as an ovaloid, or egg-shaped body, not as hitherto supposed, with equal and symmetrical northern and southern hemispheres, but with the southern hemisphere greater than the northern.

This brings the author into a vast field of inquiry and speculation in astronomy, physics, and geology. He thinks it may be possible hereafter, by an extension of pendulum observations—which may be made on any island, and therefore in oceanic regions where other geodetic operations are impossible—to obtain a knowledge of the separate ellipticities of the two hemispheres. He states that the perihelion coincided with the northern winter solstice about the year 1250, when the northern hemisphere received a maximum amount of heat in excess of the southern ; that since then they have been slowly separating, and at the end of 10,450 years will complete a semi-cycle, when the southern hemisphere will receive a maximum excess of heat over the northern ; he conjectures that ice will then accumulate around the North Pole, the waters of the ocean will flow from south to north, the lands in the northern hemisphere will become submerged, while those in the southern will become dry, and the relative shapes and sizes of the two hemispheres will become perceptibly altered. Not only will this happen, but "it is not improbable that civilisation will disappear, and a cloud of intellectual darkness will settle over mankind." Finally, he conceives that on the completion of the cycle, when the figure of the earth will be presumably restored to what it is at present, "men may wake out of their mental stupor and begin to make feeble inquiries about the size and shape of the earth on which it is their destiny to dwell."

The last chapter of Part I. treats of the earth as a geoid, which word is used to designate the actual figure of the surface of the waters of the oceans. This chapter is entirely speculative, and not always correct in its rendering of known facts. Thus it states that "where the earth's crust is of most density and thickness, there it rises ; where the crust is of least density and thickness, there it falls." Now, the Indian pendulum operations have clearly shown that the reverse of this is true, that there is a deficiency of density under the great Himalayan Mountains to the north, and an excess of density under the bed of the ocean to the south ; the Indian geodetic operations tell the same tale, showing that on the coast lines the plummet is deflected outwards towards the ocean and not inwards towards the land.

Part II., on the Principles of Least Squares, is the most complete portion of the volume. It gives very full information of the method of applying mathematical theory in determining the most probable results to be deduced from groups of fallible observations, an occupation which has much fascination for some computers, but which scarcely repays the labour involved when the observations are burdened with unascertainable constant errors.

Part III. is half on field work and the remainder on the reduction of the observations. The details of the reductions are the weakest part of the volume ; they do not go beyond the treatment of single triangles, and thus do not touch on the steps to be taken for the harmonisation of the angles of a great triangulation, *inter se* and between the fundamental base lines and astronomical azimuths, and the further steps to be taken to produce identical values of the latitude and longitude of any station, through whatever course the computations may be carried. These steps are unnecessary for the treatment of a topographical triangulation, but are essential for every great geodetic triangulation.

A chapter is given on what is curiously called "The LMZ problem," which turns out to be the finding of the latitude, the longitude, and the reverse azimuth of a new station, when its distance and forward azimuth are given from a station of which the latitude and longitude are known. But the given formulæ are only applicable in cases when the distance between the two stations does not exceed 12 miles ; they are thus inadequate for the ordinary geodetic calculations which are of constant occurrence in every great survey.

Russia under Alexander III. and in the Preceding Period. Translated from the German of H. von Samson Himmelstierna by J. Morrison, M.A. Edited, with Explanatory Notes and an Introduction, by Felix Volkhovsky. London: T. Fisher Unwin, 1893. Pp. 36+306.

We commend this work to all who are interested in the Russia of our own time. It is not a history, but a series of political studies of the history and of the dominant personalities that have shaped Russia's course in the recent past and are determining it at the present time. In Russia the character of the Tsar as an absolute ruler attracts the eye of the political student. Here an interesting account is given of Alexander III. as Tsarevich and as absolute ruler, of the Empress and the Court, and of the personages of the Court and the State. English readers will be interested in comparing the critical estimate of this German author with some other accounts which have been persistently presented to them for their acceptance. Von Giers, the principles of his policy, and some of the characteristics of his position, are briefly discussed. At the present juncture one of the most interesting chapters is an account of Pobyetonostsev as Minister. We should have welcomed, in connection with the discussion of the political policy of the Orthodox Church as directed by Pobyetonostsev, a critical study of the fanatical idea of Russia's mission. This is one of the most disturbing political forces at work in Russia. Here the original author, or it may be the English translator, gives little or nothing about it. One of the longest chapters is devoted to Finland, and the treatment is worthy of the space assigned to it. The Finns and their country have many friends in England, and this sympathetic account of their history and aspirations will be cordially welcomed. We should have liked to see a similar account of the people of the Caucasus, and a critical study of Russia's policy with regard to the Armenians. As we are not acquainted with the German original, this omission may, for all we know, be due to the original author. If there are chapters, however, in the German work dealing with the questions and with the political policy of the Orthodox Church to which we have referred, we should be glad to see them incorporated in a new edition of the present work. The rest of the book will prove to many the most interesting and instructive. It comprises an account of the Aksakov family and of the Slavophil movement with which their names are associated. One chapter is given to M. N. Katkov, and another to Krayeevsky and Byelinsky. In these we have instructive accounts of the literary movements, which are intimately connected with the political. One chapter, which is of considerable importance for the history of both politics and literature, is a sketch of Alexander Koshelev, and a study of his *Memoirs*. Some little prejudice of the German author's with regard to Koshelev's Polish policy is animadverted on, with a critical comment by Mr. Felix Volkhovsky. The latter, too, has contributed an interesting introduction and a series of critical notes. The thanks of all interested in the study of Russia are due both to Mr. Morrison and Mr. Volkhovsky for making this work accessible to English readers. We hope that, when a new edition is issued, an index will be added.

Die Schreibung Geographischer Namen. Von Professor Dr. W. Köppen. Hamburg: Verlag von G. W. Seitz, Nachf., 1893. Pp. 39.

Dr. Köppen opens his treatise with a sketch of the origin and progress of the movement to which it relates, namely, the reform of the modes of spelling geographical place-names. The honour of initiating this movement belongs to the London Geographical Society and the British Admiralty, which in 1885 prescribed rules for the spelling of such names. The Geographical Society of Paris followed suit

in the next year; and the rules it adopted, though neglected by French writers, were nevertheless accepted by the French Ministry of Marine in June 1887. Germany took action towards the end of 1888, when her Hydrographic Office published rules for use on marine charts. On the other hand, her Geographical Societies have not as yet taken up the question officially—not even the most illustrious of these, the Deutscher Geographentag, which left it undiscussed, although it was one of the subjects entered on the programme of the meeting held in Berlin in 1889. In the autumn of 1890 the United States Government created a "Board on Geographic Names," the decisions of which were ordered to be accepted by the War, Navy, Post Office, and certain other State departments. The scheme of vocalisation and of transliteration which this Board adopted has been described by Dr. Burgess in the January number of this *Magazine* for 1892. Our author passes some remarks on this scheme, and then notices with regret that the principles of spelling followed by Kiepert and v. Richthofen in their maps and writings have not been more widely used. In a comparative table he shows how far their system is in agreement with those of the London, Paris, and Berlin Hydrographic Offices respectively. This table shows us that in certain difficult points with respect to *y*, *v*, *kh*, and *sh* and the five chief vowels these systems are all in a welcome agreement, as they are also with respect to the pronunciation of the consonants *p*, *b*, *t*, *d*, *g*, *f*, *h*, *gh*, *r*, *l*, *m*, *n*. Where the official systems differ from that of the two German geographers they are not in agreement among themselves, and this leads Dr. Köppen to remark that the systems in question have been formed with but little regard to the science of phonetics, and that they show a want of clearness in the definitions of the technical terms which they employ. As misunderstandings have thus arisen, and are inevitable without a clear apprehension of all questions regarding the writing of sounds, he has judged it necessary before exhibiting the rules which he has himself prepared, and which he proposes to lay before this year's diet of the Geographentag, to discuss the subject of vocal sounds, showing how they are produced, how classified, and by what signs they can be most conveniently represented. These rules, with their exceptions and the requisite explanations, form the main part of the treatise. They are twelve in number, the first four being applicable where the three official systems are in unison, the next five where the systems are at variance, and the remainder where they have given no clear deliverance. There follows next a discussion of the new official mode of writing names of places in the African territories under German protection. Want of space precludes us from noticing even the most salient points in the rules set forth. Dr. Köppen's work is admirable throughout, and no one can peruse it without the conviction that he is a thorough master of the difficult subject with which he deals in all its bearings. His proposals will no doubt receive the attention which they so well merit, not only in Germany but throughout the civilised world. We even venture to think that the ultimate settlement of the question of an International Alphabet will be based very much on the lines which he has laid down with so much learning and judgment.

A Travers le Japon. Par L. Ussèle, Garde-général des Forêts. Paris : J. Rothschild, 1891. Pp. viii + 172.

This is a small volume published by the Mission du Ministère de l'Agriculture. It touches on the climate, geology, and hydrography of Japan ; but concerns itself mainly with forestry and matters more or less directly concerned therewith. The book is well illustrated, not only with drawings of the more characteristic plants of Japan, especially those used in the arts, but also with cuts showing some of the industrial applications. The beginnings and endings of the chapters are also

decorated with dainty sketches executed in true Japanese style. The Japanese names of trees and woods are invariably given, spelt in accordance with the usual French phonetic system; and a complete list of these, with their botanical equivalents, is added at the end. The transliteration of the soft *g* sound in the middle of a Japanese word—almost exactly our final *ng* in *sing*—by the combination *gn* is, however, distinctly misleading. Besides, M. Ussèle is not quite consistent, for he spells *Tsuga* (the larch) *Tsouga*, but gives *Tsuge* (the boxwood) in the form *Tsougné*—yet the *g* sounds exactly the same in both. Also, it would be difficult to recognise in *Segni* the Japanese name *Sugi* for the *Cryptomeria Japonica*, one of the most beautiful of Japanese trees. These may be small points, but in a scientific work we should have, above all, accuracy. Otherwise the book contains a great deal of most interesting and valuable matter, and will repay careful reading.

The Mutual Relations of the Sun and the Earth. A Study in Physical Geography. By C. Robertson. Edinburgh: Printed by St. Giles Printing Company, n.d. Pp. 39.

The author of this pamphlet is an astronomical heretic. His starting-point is that "no rational and intelligible explanation of geographical facts can be given under the astronomical theory that the earth is a planet." He has satisfied himself that the Copernican theory is all wrong and that the Ptolemaic theory is right. "The earth, the sun, and the moon constitute one great primary and geocentric system." The sun's diameter, "instead of being one hundred times greater, is probably one hundred times less, than that of the earth." Any one who wishes to know how these conclusions are reached must read Mr. Robertson's pamphlet.

The Gentleman's Magazine Library: English Topography. Part III.: Derbyshire —Dorsetshire. London: Elliot Stock, 1893. Pp. xi + 361.

There is, we cannot help thinking, an admirable educative force lying quite fallow in our midst; for, as far as we know, it has occurred to none of our educational legislators to turn to account the powerful and lasting influences that could be drawn from local history. For the purposes we have in mind, local history need not be regarded as confined to this or the other particular parish or even town. These are to be looked upon rather as the starting-points whence a child's historical knowledge could be gradually extended, always in close conjunction with, and dependence upon, geographical conditions. That the study of history would thus be made much more vivid, be brought home closer to the mind and heart, and seem more directly in immediate continuity with our existing life, need not be dwelt upon; still less the immense influences for good that quicken a character which has early imbibed the warm, strong nourishment of local patriotism, love for the place one was born in, and where one's ancestors have lived and laboured. We have been led to give brief utterance to these ideas, which we have long cherished, through having had put into our hands the third volume of the reprints from *The Gentleman's Magazine* in the series dealing with English topography. We have the greatest pleasure in stating that the conception which has been the originating cause of this book is an excellent one, and that it has been carried out in a manner that is equally excellent, though we cannot but question the fitness of *white* covers for books that are in some sense works of reference. The present volume contains the notices relating to Derbyshire, Devonshire, and Dorsetshire that were contributed to *The Gentleman's Magazine* between the years 1731 and 1868. The entries under Devonshire are of course on the whole the most interesting, especially the accounts of Lidford, Dartmoor, Bideford,

and Awliscombe; yet no paper can be said to exceed in interest the passages under Whittington Church in Derbyshire, where we read details of measures concerted between the Earls of Danby and Devonshire and Mr. John D'Arcy three weeks after the landing of William of Orange in 1688. To the local antiquary and historian these pages are full of very useful, and some of it very valuable, information; but there is also much that the student of folklore and of social history will read with great pleasure. As we have not seen the first volume of this series, we do not know what arrangements, if any, have been made for reproducing the many plans and illustrations that are alluded to in the various notices. We can only say we sincerely hope they are not to be left out altogether. Their appropriate place would be in the text, or at all events in the volume, in which they are discussed. Without them some of the notices are sadly shorn of intelligibility.

Vom Kaukasus zum Hindukusch. Reisemomente. Von BERNHARD STERN. With 12 full-sized illustrations, 33 smaller ones, and a supplement: *Kaukasische Marschrouten.* Berlin: Verlag Siegfried Cronbach, 1893. 8°. Pp. 322. *Price* 6 *M.*

Dr. Max Ritter v. Proskowetz, in the *Mitth. d. k. k. Geog. Gesell. in Wien*, Band XXXVI. No. 1, p. 66-70, has given ample proof that Herr Stern, without the least acknowledgment, has plagiarised from a book by himself entitled *Vom Nowastrand nach Samarkand.* He seems also to have utilised, without a line of recognition, the *Travels to Bokhara* of Sir Alex. Barnes, Dr. W. Radloff's *Aus Siberien*, and A. Leist's *Georgica*. From blindly following the latter in one particular, or in quoting from the same source, Herr Stern has been led astray. At p. 55 he says: "Nina's (St. Nina, the saint who converted the Georgians to Christianity) tomb lies in the village of Sygnach (*recte*, Sighnakh), in the Georgian province of Kakheti. Sygnach covers a round hill on three sides from top to bottom. The upper portion of the village has a ruined wall, which was formerly thirty feet high. Behind it lies the well-preserved monastic church of Bodby (Bodbe). . . . It is said to have been built by Nina herself, and contains the tomb of the female apostle." Herr Stern then breaks out into three-quarters of a page of dreamy rapture at the entrancing beauty of the place, from which can be heard the "resounding beat of the waves of the Alazan, as it flows like gleaming silver through the valleys," etc. Though he never actually states that he visited this wondrous spot, a reader would naturally imagine that he had done so. But he never could have been at Sighnakh, for the church at Bodbe, where St. Nina lies buried, is situated on a hill two and a half miles south of that town, and the nearest bend of the Alazan river, which flows lazily between soft, muddy banks, is no less than seven and a half miles distant. It is quite possible that Herr Stern was never personally at Mtskheta, though he devotes a chapter to its description. In eleven pages he only uses the first person once, and he has certainly incorporated phrases from Herr Leist's work in a way that is unnecessary had he actually visited that venerable site. At pp. 79-80 there is a long dialogue between Herr Stern and the daughter of an Imeretian fisherman, which bristles with improbabilities from beginning to end, apart from the unlikelihood of an Imeretian girl, living in an isolated hut on the Rion, being able to converse in Russian. According to Herr Stern, Samarkand, the furthest limit of his travels, is on the Hindukûsh. Enough has been said to show that as a traveller B. Stern is unreliable and extremely wanting in accuracy; we may also add that to the common stock of useful knowledge his book adds positively nothing.

American Life. Translated from the French of Paul de Rousiers by A. J. Herbertson. Paris: Firmin Didot and Co., 1892. (Sold by Cassell and Co.) Pp. 437.

There is a large amount of interesting information in this work. The industries of the west are first described—the cattle and horse ranches, the great cities which collect country produce for distribution throughout the world, the gold mines—and many questions directly or indirectly connected with those industries are discussed. Then the commerce, the economic conditions, and large manufactories of the east are described with equal thoroughness; and, lastly, there are several chapters on the social life of the Americans. Dispersed throughout the book are many anecdotes illustrating American characteristics—the unwearied energy and, sometimes, recklessness, the versatility, the feverish restlessness exhibited by the citizens of the United States, and the absence of refinement and woful want of taste in all matters of art that are common to a large proportion of them.

The translator is evidently a tyro. The French construction is often clearly perceptible through its dress of English words, and the rendering of French words by their English derivatives, regardless of differences in meaning, occasionally produces comical, and not always intelligible, expressions. However, Mr. Herbertson improves as he approaches the end of his work, and, no doubt, has carefully adhered to the original.

Notes and Queries on Anthropology. Edited for the Council of the Anthropological Institute by J. G. Garson, M.D., and C. H. Read, F.S.A. Second Edition. London: The Anthropological Institute, 1892. Pp. 232.

It is unfortunate that, as a rule, travellers in countries inhabited by savage or barbarous peoples have little knowledge even of the elements of anthropology, and are untrained in the art of observation. This necessary *vade mecum*, in a second, enlarged and revised, edition, is intended for their benefit. The whole subject is now divided into Anthropology and Ethnography, and each division is broken up into a great number of sections. The anthropological division is almost entirely new. To each section is generally annexed a longer or shorter series of questions to aid the traveller in his inquiries, and to point out the information it is desirable to obtain, though he will be very lucky if he can get answers to a small fraction of them. Though the book is admirable, a few retrenchments might be made and a few omissions supplied with advantage. At page 171 it is suggested that as complete a grammar as possible should be made, which is right enough; but then follows a string of questions, many of which are virtually implied under the notion of grammar, and would either be answered in the grammar, or failing that, could not be answered at all. These questions are therefore superfluous. At page 192, questions like: "95. Any knowledge of mines or fougasses? 99. Do they sit down and invest the place? 105. Are outposts arranged on any regular system?" etc., need hardly have been put. At page 195, "2. If the latter (nomadic), what induces its migrations?" is sufficient, but it is followed by: "to find fresh pastures for cattle, to escape the severity of summer or winter climates, for purposes of fishing or hunting, for purposes of trade or barter, or for what purpose?"—suggestions which might well be omitted. As regards omissions, it is remarkable that there is not a single question about sign language, or whether it is true that some savages are so dependent upon gesticulation that conversation has to be broken off when it becomes too dark to see. Though there is a question at page 143 (15) whether there are "any superstitious usages as to birth and naming of children," there is no question asking what sort of names are given, and how they are fixed upon, independent of superstitious usage. The very ancient practice of trepanning and its

object is passed by without notice. At page 111 it might have been asked if any notion of luck was connected with a wooden pestle and mortar—indicated, for instance, by their burial under the threshold of a new house. Under the heading "Punishment," there is no hint at vicarious punishment, such as is practised in China. The heading "Relationships" is treated rather curtly, and nothing is asked about prohibited degrees of consanguity apart from totemism. At page 206 a question might have been inserted as to whether a sick man is allowed to die inside a house—for in some places he is carried outside so as not to defile it by death—or whether objects placed in a grave are first rendered unserviceable. Of course it would be curious and instructive to know what the savages think of the inquisitive white man, and how they interpret his actions and habits, but information of this sort has been left to the discretion of the traveller himself. These omissions, however, are very trifling compared with the immense mass of useful suggestions to be found in the handbook, which is quite indispensable for future travellers.

Poland. By W. R. Morfill, M.A. ("Story of the Nations" Series.) London: T. Fisher Unwin, 1893. Pp. 389. *Price* 5*s.*

Mr. Morfill's volume on *Russia*, in this series, was such an admirable one that the highest expectations were formed regarding his *Poland*, and they have not been disappointed. Complete, concise, interesting, this volume tells the sad story of the Polish nation. Mr. Morfill arouses once more our interest in a gallant yet misguided people, who, if they had but avoided internal dissensions and evinced common sense, might to-day have been one of the greatest nations in Europe. The truth is, the Poles were their own worst enemies, and showed in an eminent degree their unfitness for self-government.

In order to write the history of Poland, a knowledge of the Polish language and literature is, of course, necessary, for constant reference has to be made to Polish authorities. Mr. Morfill is proficient both in Polish and Russian, and has evidently carefully examined all Polish books of importance elucidating the history of the country. Not only so, but he devotes a chapter to "Polish Literature," including references to the world-renowned astronomer Copernicus (1473-1543), and Adam Mickiewicz (1798-1855), the greatest poet that Poland has produced. He also adds a valuable list of "Authorities for Polish History, etc."

Of the history of the nation the author gives a graphic account, showing the desperate straits its rulers were invariably reduced to by the omnipotent Diet, an extraordinarily constituted body, one of whose rules (the *liberum veto*) was that if a single member objected to a resolution it had to be abandoned. "Certainly," said a writer in the seventeenth century, "there is no assembly in Europe more subject to disorders, more distracted by cabals and factions, and, in fine, more corrupted by bribery and base practices."

At the same time, it must be with a glow of pride that the Poles remember that it was by his magnificent victory over the Turks before Vienna that their sovereign, John Sobieski, and his Polish army saved the Emperor of Germany from losing his Austrian dominions in 1683. Yet, after this, the most glorious event in Polish annals, "Sobieski was ill supported by the turbulent Polish nobility, who gave another proof of their utter want of patriotic feeling."

The history of Poland touches that of Scotland in an interesting way, for Clementina, the granddaughter of John Sobieski, was the mother of Charles Edward Stuart, who possessed much of the spirit of his great-grandfather. Clementina married the son of James II. of England, commonly called the Old Pretender. Their two sons were Charles Edward and Henry, the latter of whom became a cardinal.

Mr. Morfill, of course, narrates the insurrection led by Kosciuszko in 1794, which ended in the latter's defeat by the Russians near Warsaw. Campbell's well-known line, however,

"And freedom shriek'd when Kosciusko fell,"

does not imply that the patriot died on the battle-field, for he afterwards retired to Switzerland, and died there in 1817, aged seventy-one years.

A map illustrative of the partitions of Poland is prefixed to this volume, but the various partitions are not clearly marked on it. Everything else in the book is admirable, and the illustrations are excellent.

Nederlandsch Oost-Indië, beschreven en afgebeeld voor het Nederlandsche Volk door P. A. VAN DER LITH. Met 32 Platten. Afl. 1-5. Leiden : E. J. Brill, 1893.

This is a revised edition of a work which appeared, as may be inferred from a remark in the introduction, fifteen years ago. It has, however, been carefully amended so as to bring it up to date. The subjects chiefly dealt with are the natural features, the fauna and flora, minerals and vegetable products ; and, as far as we have been able to test the work, the information is collected from the latest records of travellers, and may, on the whole, be relied upon. Occasionally, as regards the heights of mountains and the lengths of rivers, for instance, Heer van der Lith's figures may be doubted, but in many cases there is an absence of reliable information on such points. Java naturally occupies a large number of pages : the chief towns are described in detail, the railway routes are laid down, and the scenery is vividly depicted. In Sumatra rather more space might have been spared for Atjeh and the Battak lands, while Nias, Engano, and the other islands deserve more than mere mention. For the account of the geography of Dutch Borneo and its natural resources the most recent data have evidently been utilised, though here the author has surely made a mistake in the length of the navigable course of the Kapuas—125 geographical, or over 675 English, miles ! Four hundred miles is probably nearer the mark.

Some of the most interesting pages are those in which the fauna and flora of the Eastern Archipelago, with their many singular forms, are noticed. Wallace's boundary of the Oriental and Australian zoological regions, and the origin of the peculiar faunas of the various islands, are also discussed, but in words too few for such an intricate subject, nor does the author appear to have seen Wallace's latest statement of his theory ; in *Island Life* the supposition here quoted that Java had at some period a connection with Siam independent of Borneo and Sumatra is abandoned. It may also be remarked that it is not enough for the purpose of such a discussion to count up the forms peculiar to an island, or common to two or more, irrespective of species, relative capacity of locomotion, etc.

The book is well printed, and contains many good photolithographs. The division into paragraphs only is not to be recommended : it seems strange to pass from Java to Sumatra and from Sumatra to Borneo without any more decided break, and the reader would find the perusal of the book much more agreeable if it were divided into chapters.

Tours in Norway, Denmark, and Sweden. Leith : James Currie and Co. Pp. 64. N.D.

A neat, brightly got-up little guide-book, containing a fair amount of useful matter, and illustrated by a number of pictures of scenery and maps of unusual clearness. Any one intending to make a trip to Scandinavia will find it serviceable.

NEW MAPS.

EUROPE.

RIESER FERNER (TIROL), Karte der intrusiven Kerne der ——. Von Prof. Dr. Ferdinand Löwl. Massstab, 1 : 100,000. Nebenkarten : 1, Der Campellio-Bruch. Massstab, 1 : 100,000. 2, Der Granitbogen von Süd-Tirol. Massstab, 1 : 2,000,000. *Petermanns Geogr. Mitteilungen, Jahrgang* 1893, *Tafel* 6.

SWITZERLAND, Stanford's New London Atlas Map of ——. Scale, 1 : 506,880, or 8 miles to 1 inch. *London: Edward Stanford.*

This Map of Switzerland is a reduction from Dufour's well-known Survey Map in 1 : 100,000. The present edition is without names, and is printed in umber direct from the copper-plate. Only 100 copies are offered for sale, at the price of two guineas each. The relief of the country is well shown, and the map is very suitable for framing.

ASIA.

JAPAN, Verteilung der Erdbeben in ——, 1885-1889. Von Alexander Supan. Massstab, 1 : 7,500,000.

Petermanns Geogr. Mitteilungen, Jahrgang 1893, *Tafel* 2.

BARAM, DISTRICT SARAWAK, BORNEO, Sketch Map of ——. By Charles Hose, 1884-1892. Scale, 1 : 600,000. *The Geographical Journal, March* 1893.

AFRICA.

EGYPT. Inspection General of Irrigation, Provinces of Beni Suêf, Isnâ, Gizah, Minya Qinâ, Girgâ and Assyût. 7 sheets. Scale, 1 : 100,000.

Presented by the Ministère des Travaux Publics, Cairo.

RIVER JUB, Survey of the ——. By Commander F. G. Dundas, R.N. Scale, 1 : 1,000,000. Insets : River Jub, Entrance and Bar. Scale, 1 : 50,000. The Coast between the Mouth of the Jub and Kismayu, along which it is proposed to construct a tramway. Scale, 1 : 250,000.

The Geographical Journal, March 1893.

BRITISH CENTRAL AFRICA, Part of ——. From Surveys, Maps, Notes, and Astronomical Observations. By Joseph Thomson, in command of the British South Africa Company's Expedition, 1890-91. Scale, 1 : 2,000,000.

The Geographical Journal, February 1893.

THE TERRITORY OF THE KATANGA COMPANY, A Sketch Map of Part of ——, illustrative of the Progress of Recent Exploration. By E. G. Ravenstein. Scale, 1 : 3,000,000. *The Geographical Journal, March* 1893.

SOUTH AFRICA, Part of ——, showing the routes of Frederick Courtney Selous, 1872-92. Scale, 1 : 5,000,000. *The Geographical Journal, April* 1893.

BRITISH BECHUANALAND AND THE KALAHARI DESERT, Part of ——. From Observations taken by E. Wilkinson. Scale, 1 : 2,000,000.

The Geographical Journal, April 1893.

AUSTRALIA.

MAP showing the Explorations and Discoveries in South Australia and Western Australia, made by the Elder Scientific Exploring Expedition, commanded by David Lindsay, 1891-92. Compiled and drawn by D. Lindsay and L. A. Wells. 2 sheets. *Presented by Sir Thomas Elder, G.C.M.G.*

THE SOUTHERN ALPS OF NEW ZEALAND, The Central Portion of ——, compiled from the Government Survey, with additions by A. Harper and others. Scale, 1 : 126,720. *The Geographical Journal, January* 1893.

THE SCOTTISH GEOGRAPHICAL MAGAZINE.

ON SUNSHINE.

By H. N. Dickson, F.R.S.E.

(*With a Map.*)

To obtain a satisfactory working definition of the term sunshine is more difficult than is at first apparent. The "possible sunshine," or maximum time during which any direct rays from the sun can reach a point on the earth's surface is, of course, limited by the interval between sunrise and sunset—this much was included in the philosophy of Corin the shepherd—but when we come to decide whether, at any given instant, the sun is actually "shining" or not, we introduce subjective considerations of some complexity.

The sun emits, in different proportions, rays of various wave-lengths; and the radiations made up of these are capable of producing certain effects which appeal to our senses in different ways; some are known to us by the results of chemical action on particular substances, others by sensations produced on the retina of the eye, and yet others are recognised as heat effects. So far as we know, the relative proportions of rays leaving the sun remain unchanged until these rays reach the outer boundary of the atmosphere, but in transmission to the earth's surface absorption takes place, amounting, according to Langley's researches, to as much as 40 per cent. of the whole; and in the course of absorption the proportions of rays of different wave-lengths are changed, for the atmosphere exhibits selective powers, stopping some rays more readily than others. While there is, on the whole, a marked tendency towards special selection of certain rays in preference to others, the relative amounts absorbed are continually varying, and in this way the radiations reaching the earth's surface from the sun are made up, at different times, of different constituents; or, at least, the same constituents are present in different proportions. But the variation of the constituent rays produces corresponding changes in the different radiation

effects; a given intensity of chemical action does not necessarily correspond to a fixed brightness, or to a definite intensity of radiant heat. The photographer knows that the same brightness of sunlight does not always correspond to the same energy of chemical action, and strives to cultivate the actinic eye: and on bright days the sun seems sometimes to possess little "heating power."

The exact nature of the process of atmospheric absorption is far from being fully understood. Perfectly clear dry air is probably almost quite transparent to the sun's rays, and although conclusive proof is not forthcoming, it is usually assumed that *dry* aqueous vapour has little absorptive power. The stoppage of rays in transit through the atmosphere is chiefly effected by the minute dust-particles everywhere present, and the nature of the absorption depends in great measure on their size and number. When the dry air is comparatively dust-free, or the particles very small, few rays are stopped in their course, and the sun's disc appears accordingly very bright: there is at the same time relatively little scattered light, and the sky has a dark blue colour. If the suspended particles increase in number and size, the rays of shorter wave-length and less penetrative power are stopped first, the sky appears lighter in colour, tending towards a whitish "sickly" hue, while only red rays of longer wave-length are transmitted freely, and the sun accordingly appears red. The actual size and number of the dust-particles in the air vary greatly from time to time and from place to place, but, apart from these changes, the particles perform an important function as nuclei for condensation of the aqueous vapour in the atmosphere. When a certain humidity, probably always below saturation, is reached, each particle has a certain amount of water deposited on it, depending partly on the total number present, and partly on the substance of which each is composed: with a given allowance of vapour each particle receives more water the fewer there are present, and some substances, such as salt thrown into the air from sea-spray, have great power of attracting moisture. The water thus deposited increases the size of the particles and therefore their power of arresting the solar rays, until as an extreme case visible cloud is formed and the direct rays are practically stopped altogether.

Since we can estimate the duration or intensity of sunshine only by measuring its effects, we are therefore warned that a measurement of heat effect does not necessarily afford a corresponding estimate of light or actinic effect. It would be necessary, in order to determine fully the total energy of the solar rays at any point, to measure the intensity of heat, of light, and of chemical action, and in some way to combine the three together.

The experimental difficulties in the way of observing the intensities of any solar radiations are so great that as yet it has not been possible to devise a method capable of general application at observing stations. Up to the present time the only data obtainable are those of duration, and we may take photographic sunshine recorders as recording the duration of "actinic sunshine," burning sunshine recorders of direct sun-*heat*, and cloud observations as affording an estimate of direct sun-*light*. Here again, however, it is impossible to make satisfactory comparisons; because

each of the instruments—the photographic recorder, the burning recorder, and the eye—has a quite arbitrary inferior limit of sensitiveness, which is different in each case. Usually, although not invariably, the Jordan photographic recorder registers a considerably greater amount of sunshine than the Campbell-Stokes burning recorder; seventeen months' comparative observations at Torquay[1] gave an average monthly excess of 22 per cent., ranging from 5 to 44 per cent., but this is certainly largely due to the greater sensitiveness of the former instrument, a very slight obscuration of the sun's disc being sufficient to interrupt the record of the latter, so that all sunshine falling below a high standard of heat intensity is entirely left out of account.

As the eye is unfortunately not a self-recording instrument, cloud observations are defective as regards continuity, and may be dismissed with the remark that when sufficiently frequent they show that in general the records of direct sun-*light* follow the indications of those of direct sun-*heat*.

It remains, therefore, failing the possibility of strict comparison, to choose, on grounds of practical utility, between the photographic and burning records. So far as scientific meteorology is concerned, the choice undoubtedly lies with the latter. The physical conditions of the atmosphere are ultimately dependent on sun-*heat*, the grand problem of meteorology being, in fact, to explain the phenomena of atmospheric circulation as consequences of gain and loss of heat by radiation; and it therefore seems obvious that the more generally useful sunshine recorder is one which registers the length of time during which the sun's rays exceed a certain minimum of heat intensity. On the other hand, the light and actinic effects are extremely important in all applications of meteorology to plant and animal life. We know that any amount of dark heat alone will not enable most plants to grow in a normal healthy condition, and, again, Sir William Siemens has shown that, given proper supplies of dark heat, plants flourish and ripen under the rays of the electric arc, if, and only if, these rays are filtered through plain glass. Stokes, in 1859, showed that plain glass intercepts nearly all the actinic rays emitted by the electric light, whence Siemens concludes that an excess of these rays is not beneficial but destructive to plant life, and these are just the rays chiefly absorbed by the atmosphere—a fact strikingly illustrated by the researches of Crova, who has succeeded in photographing invisible clouds. We are, as yet, without sufficiently numerous photographic records of sunshine to discuss the practical bearings of this matter, if indeed the instruments in use are adapted to the purpose; but it deserves further investigation, particularly at high-level stations where the proportion of actinic rays is increased and the effect of direct sunshine on vegetation in all probability correspondingly altered.

We take, then, the term "bright sunshine" to mean a condition such that rays are transmitted through the atmosphere which are capable of producing heat effects exceeding a certain minimum intensity, a minimum determined by the circumstances of the instrument employed in record-

[1] *Quart. Jour., Royal Meteorological Society*, vol. xix. p. 91.

ing. The burning recorder of bright sunshine most commonly used is that known as the Campbell-Stokes. In December, 1854, Mr. J. F. Campbell of Islay erected on his house in Whitehall an apparatus consisting of a hollow sphere of glass filled with acidulated water, placed concentrically in a wooden bowl of such diameter that the sun's rays, passing through the glass, were brought to a focus on the concave surface of the bowl and left a charred trace thereon. The bowl being put in position on the shortest day, the trace was made near its upper margin, and as the sun attained greater elevation the record for each day was lower than that for the day preceding, the lowest point being reached at midsummer, when a new bowl became necessary. On the second bowl the daily trace began near the bottom, and gradually returned to the old position near the margin at the winter solstice. In 1857 a solid glass sphere was substituted for the hollow one, and the instrument remained in continuous operation for seventeen years. The records of the twenty years to 1874 have been discussed by Sir Henry Roscoe and Professor Balfour Stewart (*Proc. R. S.*, 1875, p. 581). In 1875, experiments were made at Kew Observatory which led to the wooden bowl being replaced by a strip of card held by clamps, and finally, in 1879, Sir G. G. Stokes devised the form of metal frame for supporting the card now in ordinary use. Continuous records with this form of instrument date from the year 1880, and the Meteorological Office has recently published the results for the ten years, 1881-90, for the British Isles. It may be well to note again that the instrument frequently fails to record when the sun is at very low altitudes, and *always* fails for at least a quarter of an hour after sunrise and before sunset.

In discussing sunshine records, it is in the first place necessary to distinguish the cases where allowance must be made for latitude from those where the actual duration merely is required. The total heat received directly at a station is a function chiefly of the length of time the sun shines, and of his altitude during that time; this quantity would naturally form the basis of calculation, and also, if we restrict ourselves severely to the merits, of comparison. But it is in general fairer, as well as more useful, to judge each station according to its opportunities, and to express the sunshine it receives as a percentage of the total possible under the supposition that the sky remained cloudless all day and every day. For the present we employ only such percentages.

Mr. R. H. Scott, F.R.S., Secretary of the Meteorological Council, draws the following conclusions from the ten years' observations in the British Isles just referred to:—

1. The sea coast receives more sunshine than the inland parts of the country.
2. The south and west coast stations, and especially the Channel Islands, are particularly favoured in almost all months of the year. Jersey is the only station recording in any month, on the mean of the ten years, an average of even one-half of its possible duration of sunshine; 52 per cent. was registered there in May and 55 per cent. in August. The highest figure for any other station was only 48 per cent.

Here we have obviously the effect of mountains. The prevailing westerly winds from the sea maintain a fairly uniform temperature until

some obstacle such as high land forces the current upwards, cooling the air by expansion, and causing the moisture to condense into cloud. After the watershed is crossed, the current, having deposited some of its moisture, redescends on the eastern plains, is warmed by compression and gradually dried; the atmosphere accordingly becomes clearer, and we find a marked, if irregular, increase of sunshine towards the eastern seaboard stated by Mr. Scott :—

> 4. The east coast of Great Britain, as represented by Aberdeen, Geldeston, and Hillington, is comparatively sunny. In the case of Aberdeen this is evidently due to the position of the observatory, with the high Braemar mountains on its western side.

These facts are well supported by Mr. Bayard's (*Quart. Jour. R. Met. Soc.*, 1892, p. 213) cloud statistics for the same period. Subtracting the mean percentage of cloud amount from 100 we get the average proportion of clear sky, and the greater number of stations shows strikingly the increased cloudiness over mountains or stations on the slopes of mountains, and the gradual clearing towards the east coast. Two causes, however, considerably mask the real effect, both due to the fact that the averages are deduced from single daily observations made at 9 A.M.: the afternoon cloud maximum, best developed inland, where the ascending currents produced by the warming of the earth's surface are strongest, is entirely missed; and undue prominence is given to the morning cloudiness which persists longest near the sea. Falmouth and Jersey, for example, have an average of 31 and 34 per cent. of clear sky at 9 A.M., the same as Cheadle and Macclesfield, although the two pairs of stations show very differently in the record of sunshine. The point is of some interest in showing in a rough manner the departure of cloudiness at 9 A.M. from the daily mean. Cloud observations at 3 P.M. would probably show a deviation almost as great on the other side.

Perhaps the most striking feature in the distribution of sunshine over the British Isles is the fact that, speaking generally, the greatest percentage of sunshine is attained in districts where the annual range of temperature is least. The annual means of sunshine for the second lustrum, 1886-90, give values agreeing with the ten years' average to within 2 per cent. at all places included in the latter series, and there are for the shorter period a considerable number of additional stations whose values we may fairly assume to be equally close to a ten years' average. Utilising these, we get a marked indication of an axis of minimum sunshine running north and south somewhat to the east of the watershed, corresponding to the axis of maximum range of temperature. Again, whenever a break is made in the main line of elevated land by a valley opening to the west coast, the higher percentage of sunshine found at the coast extends inland to the east, in the same way as the smaller annual range of temperature in the same regions. The most conspicuous example in both cases is the Bristol Channel and valley of the Severn, where the percentage scarcely falls below 30, and the excess is carried right across to the east coast. The south coast of England is in effect another instance of the same

thing. The percentage of sunshine, on the average of five years, is 36 at Falmouth and St. Leonard's; 35 at Plymouth, Rousdon, and Ventnor; and 34 at Southampton, while 30 per cent. only is recorded at stations a short distance from the coast, as Glynde, Harestock (32), and Cullompton. The sunshine gradient, as it were, becomes steeper towards the land the farther east we go, and the annual range of temperature increases in exactly similar fashion.

In the absence of more detailed information, it is of course impossible to make the above statements in any absolute sense, or, indeed, to regard them as more than a slight extension of the general conclusion that "the sea-coast receives more sunshine than the inland parts of the country," in its application to our much more accurate knowledge of the distribution of temperature. They may serve, however, to show again how completely the climate of the British Isles is controlled by the sea; for in those places where the amount of sunshine is greatest, the range of temperature, its direct effect, is least; and the direct radiation effect is most apparent where the actual sunshine is least, *i.e.* where the influence of the sea is to some extent diminished.

For purposes of illustration merely, we may, within certain narrow geographical limits, and including the whole year, assume that the duration of sunshine at a station is a rough measure of the heat transmitted to it and from it by radiation through the atmosphere, since the cases where nocturnal radiation is checked will be to some extent compensated by the formation of cumulus clouds obscuring the afternoon sun; and we may further assume that the annual range of air temperature is an equally rough measure of the effect of such radiation on the lowest stratum of the atmosphere. Hence, dividing the duration of sunshine by the range of temperature, the cause by its effect, we may arrive at a general notion of the power of the other influences which come into play—the smaller the quotient the greater the immediate effect of radiation on the air temperature, and conversely. With the exception of the most northerly and westerly stations, and of those which come under the heading of smoky cities, the chief external influence is, as we have seen, the sea; and the numbers following, calculated by the method just described, give, to what may be called an illustrative approximation, the proportion of oceanic to continental constituents in the insular mixture of climates:—

Sandwick,	67	Dublin,	77	St. Ann's Head,	96
Stornoway,	77	Worksop,	51	Cirencester,	62
Aberdeen,	70	Parsonstown,	68	Greenwich,	49
Glasgow,	53	Hillington,	60	Kew,	70
Armagh,	61	Geldeston,	67	Southampton,	72
Markree,	68	Cambridge,	59	Glynde,	63
Douglas,	92	Aspley Guise,	56	Falmouth,	93
York,	53	Valentia,	99	Jersey,	88
Stonyhurst,	59	Oxford,	58	Churchstoke,	62

The variations in the distribution of sunshine from month to month during the year show some interesting peculiarities. In *January* the coast stations show out well with 20 to 25 per cent., the Midland and

North of England—apart from the large towns—giving 11 to 15 per cent. Then follow three months of steady increase, 20 to 30 per cent. in *February*, 30 to 40 in *March*, and 40 to 45 in *April*. *May* is in most places the sunniest month, although hard pressed by *August*. Jersey comes first with 52 per cent., the south coast of England averages about 45, and the Midlands and North 35 to 40. *June* and *July* show a distinct decrease, particularly at the north-western and extreme northern stations. *August* is "particularly sunny for Central and Southern England, and particularly sunless in the north-west of Ireland and of Scotland." The south coast again averages about 45, Midlands and North about 33, and the far north-west 25 to 28. *September* shows smaller percentages all round, the north-western districts maintaining their low position. In *October*, with a further general decrease, the Irish stations show some relative improvement, and in *November* they rank amongst the sunniest. *December* is the most sunless month of the year; Jersey heads the list with only 23 per cent.

It is difficult to say how far any of the records represent purely meteorological phenomena, and how far they indicate the pollution of the atmosphere by the smoke of cities and towns. Certain it is that Bunhill Row, with its 2 per cent. in *December*, 4 per cent. in *January*, and 9 per cent. in *February*, is very largely affected by smoke, and the same is also apparent in Glasgow and other manufacturing towns. The transition stages to air in which the suspended matter is derived from natural sources alone, such as is to be met with in the open sea, offer an interesting subject for investigation, particularly with regard to the classification of different types of fogs and mists.

The autumn sunshine of Ireland and the west and north-west of Scotland, about which Mr. Scott says:—

> 5. In the summer and early autumn the north-west of Ireland and of Scotland with the Orkneys receive very little sunshine.
> 6. In the late autumn Ireland generally receives more sunshine than most of England.

may be in part accounted for by a reference to Van Bebber's monthly charts of cyclone tracks. During *September* and *October* these districts lie either directly on the line of main routes followed by depressions approaching from the Atlantic, or slightly to the right of them, in the direction of greatest humidity. One of these main routes, crossing the north of England, further accounts for the relatively low sunshine there. The south coast of England lies during these months to the left of a main track up-channel, which in *November* shifts northward, thereby increasing the cloudiness, especially to the eastward, and at the same time a subsidiary path branches south-eastward across the Bay of St. Malo—probably the cause of increased south-easterly winds in Jersey, which may explain the anomalous deficiency of sunshine there during that month. Again, the track lying directly across Ireland during *September* and part of *October* moves southward into St. George's Channel during *November* and leaves Ireland entirely clear—hence probably the increased sunshine there in early winter. The influence of these cyclone tracks is

of course most marked during the winter months, when they are most frequented, and the effects of elevated land must be taken as superposed upon those of cyclones. It is interesting in this connection to note the results of the investigations of the late Mr. Whipple at Kew, and more recently of Mr. Ellis at Greenwich, on the relation between sunshine and amount of cloud and the height of the barometer. These show that in the months from February to October there is on the whole distinct indication of increased sunshine and correspondingly less cloud with increased barometric pressure. This effect is less pronounced in early spring and late autumn, and becomes slightly reversed in winter. The diminished sunshine with high pressure in winter is, of course, the result of the cold fogs accompanying anticyclones, and the maximum sunshine occurs with intermediate pressures, probably chiefly in rear of depressions, the lowest pressures being associated with the overcast sky of a cyclone front and trough. It may be observed as a point of possible importance to hill farmers that the decrease of sunshine with winter anticyclones probably does not occur on peaks or any elevation not in the form of a table-land, the cold and fog being limited to low-lying districts, valleys, and plains.

The general form of the sunshine curve is thus a strong minimum in winter, a steady increase to a maximum in *May*, a secondary minimum in *June* and *July*, and another maximum in August, succeeded by a fall to the winter minimum. The uniform increase of sunshine percentage during spring occurs at all stations, but important modifications take place thereafter, which may be briefly summarised by saying that the *May* maximum predominates in the north and the *August* maximum in the south, and that the transition from one form to the other takes place gradually. The weakening of the *August* maximum in the west and north is, however, much more serious than that of the *May* maximum in the south. The occurrence of the former is barely noticeable except as a flattening of the curve, and even at York, Stonyhurst, and Douglas there is no actual increase from *July* to *August*, but at Southampton, Falmouth, and Jersey, where the *August* maximum is strongest, it scarcely exceeds that of *May*. The ten years' observations are insufficient to give very definite information with reference to the form of the intermediate minimum; it is impossible to fix the actual date of its occurrence in *June* or *July*. One point, however, is quite clear,—that the extent of the depression is greater near the coast than inland. At Oxford and Cambridge, for example, the mean percentage for *June* and *July* is only about 3 below that of *May*, while such stations as Jersey, Falmouth, Hillington, St. Ann's, and Douglas show a fall of 6 per cent. or more. It is noteworthy also that the curve for smoky cities closely approximates in form to the typical inland curve; Bunhill Row takes almost the same form as Oxford and Cambridge, with a mean some 10 per cent. less, and the inflection to the winter minimum somewhat sharpened.

For the practical ends of agriculture and similar industries the average distribution of sunshine from month to month is specially important as an estimate of probability. Given a certain average duration

of sunshine to the yearly credit of a particular district, how much is spent in the early part of the season, and how much is likely to be left over at the end of summer for the ripening of crops, when from other causes the harvest is late? The following table gives the fraction of the whole year's average sunshine, which is on the average recorded up to the last day of each month :—

TEN YEARS' SUNSHINE.

Per cent. of annual total received up to end of each month.

Station.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Sandwick, . .	3	7	14	27	43	57	71	81	90	95	98	100
Stornoway, . .	2	7	15	27	42	57	69	79	87	94	98	100
Aberdeen, . .	4	9	17	27	41	55	67	78	87	93	97	100
Glasgow, . . .	2	6	14	26	41	56	69	81	90	96	99	100
Armagh, . . .	3	8	16	27	43	57	68	78	86	92	97	100
Markree, . . .	3	8	16	29	44	57	68	78	86	93	97	100
Douglas, . . .	3	7	15	26	41	55	67	78	87	93	97	100
York, . . .	2	7	15	25	40	55	67	80	88	95	98	100
Stonyhurst, . .	2	7	14	25	40	54	67	79	88	94	98	100
Dublin, . . .	4	8	16	27	42	54	65	76	85	92	97	100
Worksop, . . .	3	7	15	25	40	52	65	78	87	93	97	100
Parsonstown, . .	4	9	17	29	42	55	66	77	85	92	97	100
Geldeston, . .	3	8	15	25	39	53	65	77	86	93	97	100
Hillington, . .	3	8	15	25	40	53	67	79	87	94	97	100
Cambridge, . .	3	7	15	25	39	52	65	77	86	94	97	100
Aspley Guise, . .	3	8	15	25	38	51	64	76	86	93	97	100
Valentia, . . .	4	9	18	29	43	57	67	78	86	93	97	100
Oxford, . . .	3	7	15	25	38	51	65	77	86	94	97	100
St. Ann's, . .	3	7	15	27	40	54	66	79	88	94	97	100
Cirencester, . .	3	8	16	26	39	52	66	78	87	93	97	100
Bunhill Row, . .	1	3	9	20	36	50	68	83	92	98	100	100
Greenwich, . .	2	6	13	24	39	53	67	80	89	95	98	100
Kew, . . .	3	6	14	24	38	51	65	78	87	94	97	100
Southampton, . .	3	7	15	25	38	51	64	77	86	94	97	100
Glynde, . . .	3	7	15	25	39	52	65	78	87	94	97	100
Southbourne, . .	3	8	15	25	38	51	65	78	86	93	97	100
Falmouth, . .	3	7	15	26	39	52	65	77	86	93	97	100
Jersey, . . .	4	8	16	26	39	52	64	77	87	94	97	100
Churchstoke, . .	3	8	15	26	39	52	65	78	87	93	97	100

It appears that by the end of *January* the northern and inland stations have got through 2 to 3 per cent. of the whole sunshine; coast and southern stations 3 to 4 per cent. At the end of *February* the same districts have expended about 7 and 8 to 9 per cent. respectively, and at the end of *March* 14 to 15 and 15 to 16. In *April*, positions become slightly reversed; this is an exceptionally sunny month in the north and west, and the curves for these regions are bulged forward, rounding off the *May* maximum; and they show 27 to 29 per cent. of the total sunshine spent by the end of the month, while the other stations have still three-quarters of the whole left. *May* accentuates the differences with 40 to 43 and 38 to 39 per cent., and *June* and *July* bring the matter to a climax, when the southern and inland stations have 5 to 6 per cent. more of the whole sunshine still to come than those in the north and

west. The advantage gained is, for the most part, lost in making up the *August* maximum, and at the end of *September* nearly all stations have only about 14 per cent. remaining.

The limited nature of the information conveyed makes it useless to attempt any more rigorous treatment, for which, even when heat effects are alone concerned, it is absolutely essential to have some quantitative estimate of intensity. The real importance of sunshine in determining the temperature of the air at a particular station has been fully discussed in the investigations of Zenker (for a part of whose results see admirable abstract in *S.G.M.*, 1893, p. 193). In strictly continental climates, where the transference of heat by the winds is relatively small, the whole scale of temperature changes is a record of heat received from the sun and radiated back into space. But in insular climates the temperature is largely controlled by sea winds, and the effects of direct sun heat are superposed upon those of transferred heat. Hence it would follow that the direct heat effect of the sun is thrown into the background relatively to the light and chemical effects, for these are not affected by transference. Vegetation in climates like that of Britain is accordingly under conditions similar to that of a greenhouse; it is, as it were, artificially warmed from without, while it depends wholly on natural sunshine for supplies of light and chemical energy. In his *Géographie botanique raisonnée*, A. de Candolle, dealing with the amount of accumulated heat necessary for the maturation of plants, finds that certain species, notably *Alyssum*, require a greater aggregate when growing in insular places than in continental. This would confirm the view that in the former case the required sum of heat was made up from outside in a greater degree than in the latter, so that with the same number of assumed heat units, there remained a deficiency of light and chemical energy, in making up which the sun added on the excess of heat. To put it otherwise, we may imagine that rays of a certain wavelength, presumably those most copiously sent forth by the sun, are chiefly useful for the operations of plant life, and any alteration to less useful rays must be compensated by a more liberal supply. In the present deadlock between botany and meteorology the matter certainly demands full investigation.

COLONEL YATE'S MISSION TO HERAT AND THE KUSHK VALLEY.

By Captain A. C. Yate, I.S.C.,
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In the agreement that was arrived at in 1887 between the British and Russian Governments regarding the demarcation of the Russo-Afghan frontier from the Hari-rud at Zulfikar to the Oxus at Khamiab, there was entered a stipulation that the Afghans were not to draw water for their canals at Kara-tapa or at any point on the left bank of the Kushk below Chihal-dukhterān. The object of this was to secure to the Turcoman subjects of Russia sufficient water for cultivation. It is this stipulation that is, at least in the main, the cause of the dispute which has to be investigated by Colonel C. E. Yate in conjunction with a Russian Commissioner (Colonel Ignatieff) and a representative deputed by the Amir of Afghanistan. The final settlement will rest with the British and Russian Governments, due weight of course being given to the Amir's views.

When the Russo-Afghan frontier was settled and peace assured, it is reported that the Kara-tapa plain was promptly occupied by Afghan settlers and brought under cultivation, for which purpose water had necessarily to be drawn off from the river Kushk. It is in this way that the Afghans have infringed the agreement, and the consequence now is that, as far as can be foreseen, they will have to abandon, in part at least, the canals they have made contrary to the agreement, and content themselves with what is their right and lawful due.

Colonel Yate received orders on the 22nd March to proceed as Her Majesty's Commissioner to the Kushk, marching through Afghanistan. The route to be taken was at first doubtful, but finally Kandahar-Farah-Sabzawar-Herat was the line decided on. There was some thought of Colonel Yate's travelling from Kandahar through the Zamindawar and Taimani country (quondam Ghor) to Herat. This would have been a most interesting journey, as the tract is very little known—indeed I cannot recall any European that has been across it. Ferrier did not go there. In compliance with the Amir's wishes Colonel Yate went unaccompanied by any other British officer, taking only a few servants and two or three mounted orderlies. Lieutenant Napier, who had been travelling in Eastern Persia, joined him at Herat; he speaks Russian.

Colonel Yate left Quetta on 3rd and Chaman on 5th April. A troop of the 6th Bombay Cavalry escorted him from Chaman to the frontier, where he was joined by the Amir's representative, Abdul Hamid Khan, a Tajik from the Logar Valley. The escort under him consisted of thirty regular cavalry and twenty irregulars (Khawanin Sowār). The duties of the escort and its commander were no light or irresponsible ones. Any accident would have tended to cause unpleasantness between the Amir (who had accepted the responsibility for Colonel Yate's safe-conduct) and the British Government, and we may feel sure that Abdul Hamid Khan

knew that, if any such accident happened, his life would not be worth much. Consequently at each camp every precaution was taken, four sentries being always posted. Whether this degree of vigilance was kept up all the way to Herat, Colonel Yate's letters do not relate. When we hear of these precautionary measures, we naturally recall the saying, *Quis custodiet ipsos custodes?* There was indeed a report current early in May in Quetta, which found its way into the Indian papers, that an attack had been made on Colonel Yate, but it proved to be the invention of certain unprincipled natives in Quetta, who hoped thereby to bring about a rise in prices—the Oriental has not much to learn from Wall Street.

There is one weak point about Asiatic hospitality—Colonel Yate was the Amir's guest—and that is its needless profusion. Such, however, is Oriental etiquette, and why then criticise it? We, after all, are none of us strong enough to fight against our own established fashions and social customs. If an Oriental potentate does provide, for the use of a single British officer and his suite of a dozen natives, a commissariat sufficient to supply a regiment, it is not for the recipient to complain or cavil. Be sure the suite and escort did not.

That Colonel Yate's journey from the Helmand to Herat is not without its value and interest to geographical science may be inferred from the fact that no European has travelled it since the winter of 1872-73, when Captain (now Colonel) Marsh made his *Ride through Islam* (as he calls it) from Enzeli on the Caspian to Jacobabad in Upper Sind, a distance of 1680 miles. Moreover, geography does not appear to have profited much by Captain Marsh's ride. In 1885, it is believed, a native surveyor travelled from Herat *viâ* Sabzawar and Farah to Kandahar. It can, however, be very well understood that, since the days of Eldred Pottinger, Major D'Arcy Todd, and Sir Lewis Pelly, the road from Kandahar to Herat has greatly changed. Old villages will have disappeared and new ones sprung up elsewhere. Farah, once a flourishing town, has been found to be absolutely depopulated. It is not therefore surprising that Colonel Yate should speak of the latest map of this country, issued by the Survey Department of India, as "not very correct." It presumably, however, embodies the work of the native surveyor of 1886. If Colonel Yate has had the time and opportunity of making even a rough survey and notes of the road, they will be of value. There are so many interests attaching to this route, as a main line of advance on India, and as a possible route for the railway that will ere long link that country with Europe. For my own part I hope it will be many a year before we let Merv and Chaman be connected by rail. We have strategically or commercially, as far as I can see, little to gain by such a line, and the Amir at present certainly does not intend to have it. It is for us much more to the purpose to turn our attention to the establishment of railway communication *viâ* Persia and Asia Minor to Constantinople, or *viâ* the Euphrates Valley (or Sistan and Central Persia) and Northern Syria to Alexandretta. Those who are interested in this subject should consult Mr. Curzon's *Persia* and Mr. Harrison Hayter's address (for 1893) to the Institution of Civil Engineers.

In addition to the attainment of a more accurate geographical knowledge of Western Afghanistan, the further practical results of Colonel Yate's journey are, or should be, important. In the first place, that journey is an earnest of the Amir's adherence to the British alliance, and a test of the feeling of the Afghan people towards the English as a race and nation. As all know, there has been friction of late between the Amir and the Indian Government, and, putting aside the natural fanaticism of the Afghan, we cannot expect that the memories of the war and occupation of 1878-81 are quite dead. The Amir, in inviting a British officer to watch over his interests in the Kushk Valley settlement, is conforming to the treaty which gives the Indian Government control over his foreign relations. The reception that Colonel Yate has everywhere met with, from high and low, is a strong guarantee that in future, if we on our part remain friendly, and do not needlessly give or take provocation, we shall find the Afghans friendly too. Since 1886 no one has seen Herat; and a natural interest is felt in the present state of the fortifications completed after Major Peacock's plans and under his orders. The strength and efficiency of the Herat garrison, the prosperity of the population, the arrangements for the defence of the frontier, the agricultural and commercial progress of the province—these are all points on which Colonel Yate may be able to throw light. With all these possibilities in prospect, we may fairly say that the Kushk Valley settlement, though the actual object of the journey, is little more than a side issue. It is but a question of the moment (unless it be foolishly allowed to remain an open sore), while the other points, the feeling of the Amir and his people, the state of his army and defences, the prosperity of his country, etc., are to us of deep import as long as Afghanistan is the buffer between England and Russia in Asia.

Colonel Yate reached Kandahar on the 10th of April. He was met outside the city by the colonel commanding the artillery of the Kandahar garrison, and by him conducted through the city to the citadel, where he was formally received by the Governor and all the civil and military officers. A new garden-house (*Anglicè*, villa) built by the Amir near the village of Deh Khoja (the scene of a stiff fight in August 1880) had been prepared for Colonel Yate's reception, and thither, after his visit to the Governor and a ride through the Chaharsu (large central dome on which all the streets of the bazar, and indeed city, converge) and the bazars, he retired. When the British Commissioner tells us that on his arrival at the villa he "found a breakfast awaiting him sufficient to feed a regiment," and that, nevertheless, owing to the Ramazan (Mohammedan Lent) he had "to sit down and eat all alone, because every other fellow was then fasting," we must all of us naturally feel every sympathy with him. We may console ourselves with one thought—that those victuals were not wasted. When at the fall of night the signal for the break of the fast of the faithful was given, depend upon it the Commissioner's suite and escort (some 70 souls, besides loafers) made that "breakfast sufficient for a regiment" look very small. The Oriental has a great weakness for chandeliers, mirrors, lamps, and glass of all hues and shapes, and evidently the Amir's suburban villa at Kandahar did not lack such

decorations. During Colonel Yate's stay, two Afghan officers (captains) of the garrison were placed on duty with him, and earned from him the compliment of "capital fellows." The cordiality of the people of all classes is specially dwelt on. The following sentence quoted from a letter speaks best for itself: "The bazar seems much fuller and brisker than even when we were here (1878-81), and the buildings of the city seem to be all in good repair. The Amir has built a huge caravan-serai for the Indian trade just outside the Bar Durani gate, and the whole city wears a look of prosperity." This is refreshing to hear—the more so, as when we evacuated Kandahar in April 1881, the forebodings as to its future were ominous. At all the places visited by Colonel Yate, viz., Kandahar, Farah, and Herat, the troops in garrison were paraded as a compliment to him as British Commissioner. I do not propose here to give details of their strength or equipment, or repeat criticisms on their turnout; suffice it to say that the general impression borne away was decidedly good. A writer in the *Quarterly Review* of October 1892 (*India, Russia, and Afghanistan*) gives it as his opinion that Afghan troops would not be fitted by drill and discipline to take their place in action side by side with British troops. If that writer had been with Colonel Yate, it is probable he would have held a different opinion. It is rather interesting to learn that the Afghans of high rank (governors, generals, etc.) have, at least in some cases, adopted the Russian habit of greeting each corps on parade with some complimentary formula, such as *Mānda na bāshid*," *i.e.* "your good health!" In other points of ceremonial the Afghan army, in part at least, conforms to our usage, the Afghan national anthem being played at what corresponds to our "royal salute," while our "three cheers" are replaced by a prayer for the Amir's welfare, all heads being uncovered.

There is one thing at Kandahar in which all Englishmen—both those who were there, and those who had relatives there in the war—must feel interested, and that is the cemetery. We know well that the Christian cemeteries of the first Afghan War were not respected. It is very gratifying to know that, since our evacuation of Kandahar in 1881, the English cemetery has been treated with every respect by our quondam foes, Mohammedan and fanatical as they are. To give this fact due weight, let us remember that, for a year or more after our departure, Kandahar was in a state of anarchy, now in the hands of Ayub, now of Abdur-rahman. There was no one responsible for the preservation of our cemetery. That it has escaped must be rather the result of accident than design, during those troubled times. Once Abdur-rahman's rule was established, we could, of course, rely on him to see that our cemeteries were not touched. Of the graves at Kandahar time and exposure have unfortunately obliterated all, or most of the inscriptions, so that they can no longer be identified.

Colonel Yate left Kandahar on the 13th April, and reached Bakwā (5 marches short of Farah) on 26th. The heat of the Garmsel, as the tract from Girishk to Farah, skirting the north edge of Registan (sandy desert), is called, is described as very great by day owing to the power of the sun, though the nights were delightfully cool. In consequence, the marches were, as a rule, made between two and seven A.M. Difficulty

was experienced in getting correct information as to the road ahead—the natives have but vague ideas of distance, and the map (the best apparently the Survey Department of India can produce) was found "not very correct." Bakwā is as near as possible half-way between Kandahar and Herat, being about 200 miles from each. On 1st May, Colonel Yate reached Farah,[1] where he was received by the Governor and officials, and shown the same courtesy and attention as at Kandahar. Farah was left on the 2nd May and Herat reached on the 10th. The reception accorded there was similar to that at Kandahar, but even more marked in its courtesy and cordiality. It seems absurd to us to dwell upon what appears to be mere matters of etiquette, but Orientals are very punctilious in these things. When, therefore, both the Governor of Herat and the Sipah-salar (Commander-in-Chief), in addition to the reception in durbar, each called personally on the British Commissioner, it was a public testimony of the Amir's wish that Her Majesty's representative should be received with every honour due to his position. Mere formalities maybe—but significant all the same. Before leaving Farah Colonel Yate had received a pleasant letter of welcome from the Governor of Herat, Kazi Sa'ad-ud-din. They are old acquaintances, having served and worked together on the Boundary Settlement Commissions of 1884-86 and the winter of 1887-88.

Colonel Yate was invited to inspect the fortifications, and found them in a very satisfactory state, and the troops paraded for him impressed both him and his assistant, Lieut. Napier, very favourably. It would appear that the Amir takes care that his best troops (or, at least, some of them) are where they are most wanted, *i.e.* on his northern frontier. The city of Herat itself is described as "marvellously improved since 1886, much more populated and flourishing. As to Badghis, it is all peopled and cultivated, and you would not know the country again. The Kushk here (at Chihal-dukhterān), where formerly there was nothing but pig and pheasant, is now a valley full of Afghan villages." So much for peace and prosperity under the Amir's rule. With all that is said of the Amir's tyranny, it would seem that, in some provinces at least, his subjects are going ahead and doing well.

Colonel Yate left Herat on the 14th May and reached Chihal-dukhterān in the valley of the Kushk on the 18th. The Russian frontier fort is 10 miles to the north opposite Kara-tapa, and is named Tanurah. It is under the command of a Lieut.-Colonel, and is reported to have a garrison 800 strong. Between the 18th and 25th May (on which latter date the Russian Commissioner, Colonel Ignatieff, arrived) Colonel Yate was mostly occupied in making the preliminary inquiries into the ques-

1 Farah is briefly described as the "very picture of desolation"—a great contrast to Kandahar and Herat. Colonel Yate says, "Farah is a ghastly-looking place. The earthen rampart (with ditch all round full of water) is strong, and resembles that of Herat, but the walls are weak, and the interior is a perfect desert. It has no bazaar and no inhabitants—only a governor in the citadel in one corner, and a Kabuli regiment in huts in the other." The regiment was much weakened by cholera, and the losses on eight months' campaigning at Uruzjan against the Hazaras. They were well armed, as indeed are most of the Amir's regular troops now.

tion of the water-rights in the Kushk, and so we must leave him. Should the subsequent proceedings appear to me to interest the Society, I shall make a point of sending a note on them.

THE DIVARICATIONS OF THE LOWER OXUS.

By General J. T. Walker, C.B., F.R.S., LL.D., Royal Engineers.

In a bulletin of the French Geographical Society for 1892, M. Edouard Blanc gives an interesting paper on the hydrography of the basin of the Ancient Oxus, in which the question of the probable divarications of the Lower Oxus in ancient times is discussed. At the present time the river is known to discharge itself wholly into the Aral Sea; there is, however, indisputable evidence to show that it once flowed, partially if not wholly, into the Caspian Sea. M. Blanc holds the opinion that, from the earliest Christian times up to the fourteenth century, it flowed into the Aral; that during the fourteenth century it became diverted into the Caspian, and flowed wholly into that sea through the whole of the following century; that in the sixteenth century it began throwing out branches to the north, which disembogued into the bogs and marshes of a region which is now covered by the Sea of Aral; and that in the seventeenth century the south-west branch from Urghenj—the dry bed of which debouches on the south-east coast of the Caspian, and is known as the Uzboi—became completely obstructed, and then the Sea of Aral became the sole recipient of the waters of the Oxus.[1]

For a long period there seems to have been much ignorance regarding the geography of these regions, more particularly on the part of all the Greek geographers whose writings are still extant. The very existence of the Aral Sea appears to have been unknown to them. The sea is not indicated on any map now forthcoming which was published before the commencement of the eighteenth century; whence it would appear that it was only then that the fact of there being an Aral Sea began to become generally known to western geographers.

The existence of the Caspian Sea was, however, long known, and singularly enough its position and shape and surroundings are more accurately described by Herodotus than by any of the Greek geographers of the six centuries following him. Writing about 450 B.C. he describes it as a sea by itself, having no connection with any other sea; as being about fifteen days' voyage in a row-boat in length, and eight days in breadth, and as bounded on the west by the hills of the Caucasus, and on the east by a vast plain stretching out interminably, which was inhabited by the Massagetæ. He describes a river flowing through this plain which he calls the Araxes, but has evidently confused with some other river, as

[1] *The Road to Merv.* By Major-General Sir H. C. Rawlinson, K.C.B. *Proc. of the R.G.S.*, 1879.

Notes on the Lower Amú-darya, Syr-darya, and Lake Aral, in 1874. By Major Herbert Wood, R.E. *Journal of the R.G.S.*, 1875.

he says that it rises in the Matienian mountains, and Professor Rawlinson has shown that if so, it could only be the modern Aras, which disembogues on the west coast of the Caspian. But Herodotus says of his Araxes that it flows through the country of the Massagetæ who occupy the greater portion of the vast plain stretching to the east of the Caspian; that it is about the same size as the Danube, and has large islands; and also that it has forty mouths, of which thirty-nine flow into bogs and swamps, while one flows with a clear course into the Caspian Sea. Professor Rawlinson suggests the identity of this river with the Jaxartes which flows into the northern basin of the Aral Sea; but if so, any branch it might have thrown into the Caspian must have first passed through the Oxus, a river larger than itself, and lying between it and the Caspian. It is surely more legitimate to infer that the Araxes was identical with the Oxus, and even to allow that Herodotus may have had some knowledge of the region of bogs and swamps into which he makes it partially disembogue, and to which he gives no name, though it is obviously identical with the bed of what is now known as the Sea of Aral.

Eratosthenes, two centuries after Herodotus, describes the Caspian as a bay of the North Sea, with which it was connected by a long narrow gulf. He makes both the Jaxartes and the Oxus flow into the Caspian.

Strabo, four centuries after Herodotus, falls into the same mistake as Eratosthenes regarding the connection of the Caspian with the North Sea. He says that the Caspian or Hyrcanian Sea is a bay extending from the ocean to the south; that it is very narrow at its commencement, but widens as it advances further inwards, attaining a width of about 500 stadia (furlongs) at its southern end; he gives the lengths of portions of the coast-line which appertained to different nations dwelling on the banks; he makes both the Jaxartes and the Oxus flow into this sea, and places their mouths at a distance of 2400 stadia apart. And he says that the wares of India are brought down the Oxus to the Caspian, whence they are conveyed by the Cyrus and other rivers to the districts bordering the Euxine Sea.

Pliny, writing about 50 A.D., follows Strabo and Eratosthenes, and it was not until about six centuries after Herodotus that Ptolemy restored the Caspian to its true position as a sea by itself; he makes both the Oxus and the Jaxartes flow into it; but he appears to have distorted the sea by making it about twice as broad from east to west as from north to south.

M. Blanc says that though sufficient light on the course of the Oxus in ancient times is not to be obtained from the Greek geographers, it is to be found in the works of Arabian and Turkish writers. He quotes the great Arabian geographer, Abu-Abdullah Mahomed el-Edrisi, who lived in 1099 to 1164 A.D., as stating that in his time both the Jaxartes and the Oxus disembogued into the Aral Sea, which he calls the Blue Sea; and he declares that other Mohammedan writers say the same thing up to the fourteenth century, when that sea ceases to be spoken of, and is not even mentioned by travellers, as Ibn-Batutah, proceeding from the Caspian over the very region now covered by the Aral Sea. He

points out that the Emperor Baber—who was ruler of Ferghana at the end of the fifteenth and commencement of the sixteenth century, and who had a very intelligent knowledge of his kingdom—says of the river Jaxartes (which he calls the Sihun or Sir-daria) that its lower extremity was lost in a region of sands, but makes no mention whatever of the Aral Sea. M. Blanc infers that that this can only be explained on the hypothesis that during the time of Baber the Oxus was wholly diverted into the Caspian, and consequently that the Aral received such a small supply of water that it became reduced to a simple marsh of little or no importance. But two centuries afterwards Abul-Ghazi Bayadur Khan, who was ruler of Urghenj in the seventeenth century, distinctly says that the branch of the Oxus, which flowed into the ancient Uzboi, became obliterated in his time, and that this caused great disturbance in the system of irrigation in his country, which was all conducted from the Caspian through the Oxus.

A French writer, M. Moser, has suggested the possibility of the waters of the Jaxartes having once upon a time flowed into the Oxus, and influenced the direction of its lower course. He has discussed the system of rivers in the vast plain to the north of the Jaxartes—the Chu from the east, the Talar from the south-east, and the Sari-su from the north, all of which now disembogue into separate lakes, which are at no great distance apart from each other nor from the Jaxartes. He conceives that these rivers were united in ancient times, and formed a considerable volume of water which flowed to the south, and joined the Jaxartes some little distance below the present town of Perovsk, and that the united rivers then flowed in a south-west direction through what is now known as the bed of the Yani River, which lies nearly parallel to the south-east coast of the Sea of Aral; local traditions assert this river to have been the ancient bed of the Jaxartes, and to have become dried up in the eighteenth century.

M. Blanc has paid a great deal of attention to this suggestion. In 1890-91 he travelled up the course of the Chu River, to the celebrated lake Issik-kul, which was once its source; he found that, though the lake is now too low to discharge into the river, there is geological evidence to show that it was once much higher, and considerably larger than it is at present, and may have contributed a considerable volume of water to the Chu; but this must have happened at too distant an epoch to have affected the course of the river during historic times. The whole region has been subjected to a gradual climatic desiccation, which has greatly diminished the rainfall and reduced the volume of the rivers, as is attested by extensive ruins of towns and villages, which have become abandoned because of the failure of the water supply.

Examinations of the surface of the ground, which have been made of late years by Russian topographical surveyors, have sufficiently demonstrated that the Oxus might naturally tend to flow indifferently either into the Caspian or into the Aral Sea; the ground is generally flat, with a slight slope downwards which is uniform towards both seas. The Aral Sea is 158 feet above, and the Caspian Sea 85 feet below, the mean sea-level; the Aral is 59 feet below Khojeili, a point on the Oxus 110 miles from

the Aral; thus the slope in this direction is about 6 inches per mile; the Caspian is 300 feet below a point near Khojeili, on the Urghenj branch of the Oxus, which disembogues into the Caspian at a distance of 600 miles; thus, here also, the fall is about 6 inches to the mile. Thus, so far as the configuration of the ground is concerned, there appears to be little reason why the river should flow into one sea more than the other.

It has been suggested that a change of direction may have been caused by geological disturbances to which the region is said to be liable. But the natural action of accumulations of silt in some channels during floods, tending to cause overflow elsewhere, and thus produce new channels, as is shown by the formation of deltas at the mouths of all great rivers which debouch into the sea through extensive plains, may well have sufficed to divert the Oxus from the Caspian, and throw it wholly into the Aral. Numerous great canals are carried from the river to irrigate the adjoining country, and dams are believed to have been constructed, and afterwards abandoned, and all this might, in course of time, have influenced the course of the waters. But it does not appear that sufficient information will ever be forthcoming to furnish a true history of the various transitions of the great river.

THE WILDS OF ICELAND.[1]

THE geography of the greater part of the interior of Iceland is very imperfectly known; and this is not to be wondered at, seeing that the country lies high and consists principally of deserts of sand and lava, often quite bare of grass, where the traveller must take with him enough fodder for his horses to last several days. Even of the inhabited parts the geology and geography have not been thoroughly investigated, for travelling is difficult, and the scientific explorers who have visited the island have not gone beyond the more populous parts. Moreover, the summer is short, the distances are long, and travelling on horseback is slow, so that the valuable observations made by several noted explorers are not linked together into a connected whole.

Herr Thoroddsen has spent ten summers in Iceland, visiting its unknown districts and gathering materials for a general purview of the physical geography and geology of the country. His researches are not yet quite complete, but there are few tracts he has not traversed. In some summers he made only short excursions, but as a rule he travelled long distances into the most remote localities. He has spent altogether 500 days in the saddle, and ridden about 5900 miles. In his lecture to the Geographical Society of Berlin he described the nature of his journeys, and gave some account of the physical geography of Iceland.

There are no roads in the island. In the inhabited parts the

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[1] Herr Th. Thoroddsen: *Reisen in Island und einige Ergebnisse seiner Forschungen. Verhandhungen der Gesell. für Erdkunde*, Bd. xx. No. 4.

traveller follows the bridle-paths worn by the hoofs of horses, while in the wilds he rides where he can, guiding himself by the mountains and the compass, though the latter is not always reliable owing to the large quantity of iron contained in the soil. A journey can seldom be commenced before July, for in spring the soil is saturated with snow water, and the mountains and elevated plateaus are covered with snow. Grass first appears on elevated spots in July, while in the highlands of the interior the scattered patches of verdure seldom yield fodder for horses before the end of August. The greatest hindrance to exploration is this scarcity of grass. The climate of the highlands of the interior is severe and variable; snowstorms often occur even in the middle of summer. Sandstorms also are sometimes troublesome, and in certain tracts frequent, for large areas are covered with volcanic ash and sand-drift. During such storms the darkness is intense, the horses get beyond control, and the fine sand penetrates the clothes down to the skin.

In travelling in Iceland a good equipment and much patience are particularly necessary. Many disappointments are experienced, and the traveller is often detained for several days by bad weather. As Herr Thoroddsen frequently spent several weeks in wilds many days' march from inhabited country, he had to take a large quantity of luggage. Above all, adequate provision must be made for the horses, for without them nothing can be done. Saddles and bridles must be in good order, and tools and a good supply of horse-shoes must be taken, for in the detritus and lava fields re-shoeing is frequently necessary. The lecturer found that he could not do with fewer than two companions, so that provisions enough to last three persons four or five weeks had to be carried, besides tent, cooking-utensils, sleeping-bags, blankets, instruments, and smaller articles. The baggage must be as limited in amount as possible, for fodder cannot be procured for a large number of horses. Herr Thoroddsen used a round tent, and spread on the ground beneath it a waterproof cloth as protection from cold and damp. The baggage was placed round the edge, and the travellers crept into their sleeping bags, laid their heads on the saddles, and covered themselves with blankets and sacks; in this way they kept themselves warm when there were eight to eleven degrees of cold outside. The horses, after being fed, were tied together outside the tent. The Icelandic horses are excellent animals for mountain travelling; they are hardy and enduring, and many of those which accompanied Herr Thoroddsen on his journeys gained by experience an astonishing degree of intelligence.

In good weather it is delightful up among the mountains; the air is healthy and invigorating, one travels through magnificent scenery and finds opportunities for much interesting study; one is quite one's own master, and removed from the bustle and vexations of civilisation. In bad weather it is not so pleasant; rain, snow, and sandstorms depress the spirits considerably. Among the greatest dangers of the country are the torrential glacier streams, which often carry down large volumes of water. Their muddiness conceals the bottom, and men and animals may easily stick fast in the mud. The colour changes daily, and it requires much experience to decide from the current where it is least dangerous

to cross. Several deaths occur every year in these glacier rivers. In the more remote coastal regions of Iceland it is also often difficult to make one's way. In the summer of 1886 Herr Thoroddsen travelled along the east coast of the north-western peninsula to the south of North Cape. The roads are of the most break-neck description, and the weather was most unfavourable; the drift-ice was just leaving the coast, and the cold mist, which is always present at that season, hung over the valleys and fjords. It rained and snowed uninterruptedly during the whole of August, and, as it was impossible to hold out against the weather in a tent, the travellers had to put up with the miserable huts and poor food of the natives. Along this coast the dwellings are scattered at intervals of several miles apart. The mountain ridges which separate the fjords are high, narrow, and steep, and the constant scrambling up and down is exceedingly trying for men and horses. Often the narrow path ran along the mountain side, with the surge dashing against the rocks several hundred feet below, or the horses had to pick their way over slippery blocks of stone along the shore, where the spray showered over them; at dangerous points the baggage had often to be unloaded and carried over to safer ground. In the valleys it was always raining, and on the mountains the snow never ceased to fall. The travellers waded knee-deep in snow, and had frequently to help the horses out of the snow-drifts. The inhabitants of this coast are very poor, and have a hard struggle for existence, but they seem contented with their lot, probably because they have no knowledge of any other; their chief means of subsistence are the birds they catch with great risk on the mountains of the coast, though they have also a few sheep and cows.

Iceland, as is well known, is a land of plateaus, built up of volcanic masses of old and recent origin; formations dating from before the Tertiary period are nowhere met with. The average height of the land is from 1600 to 2000 feet. The few low grounds are small and occupy only about a fourteenth of the total area. Only these low grounds, the coasts, and some narrow valleys are inhabited, while the extensive highlands are quite unfitted for settlement; the outer edges only are utilised as summer pastures for sheep. Basalt and palagonite breccia are the component rocks; the latter is found in the centre and extends down to the south, while the greater part of the west, north, and east coasts consists of basalt. Above the elevated plains of the interior rise the broad domes of the ice-covered mountains; the largest of them rest on breccia, and where the glaciers descend almost to the sea, as on the south coast, there are no fjords or harbours, for these have been filled up by detritus. The basaltic regions, on the contrary, are intersected by numerous fjords, and contain many good harbours, often lying behind narrow tongues of land, which probably are old glacier moraines.

There are many lakes in the island, but most of them are small. In the valleys of the basaltic tracts are many deep lakes hollowed out of the solid rock, as, for instance, the Lagarfljot, the surface of which lies 85 feet above sea-level, while its bottom is 275 feet below. In the highlands one finds several groups of moraine lakes, and in recent times large

sheets of water have been formed by the damming up of glacier streams (*Dyngjuvatn*). Certain lakes fill hollows formed by the sinking of lava streams (as the *Myratn*), while others are typical crater lakes. During a journey in 1889 Herr Thoroddsen discovered to the west of the Vatnajökull a grand and beautiful group of crater lakes. This country, near the Fiskivötn, is remarkable for its natural beauty; the whole surface is covered with colossal craters filled with water, and would resemble a landscape in the moon were it not for the greenish pools that show themselves everywhere among the coal-black lava, the brownish mounds of ashes, and the red heaps of scoria.

Tectonic movements and subsidences have played a great part in the formation of Iceland, while the minor details of the surface configuration are of course due to erosion. Real mountain chains upheaved by lateral pressure are nowhere to be found. Any one sailing along the coasts, especially those of the eastern and western districts, can perceive at a glance the construction of the basaltic mountains. The flanks, almost perpendicular, appear like Cyclopean walls, and consist of horizontal, or only slightly inclined, strata of rock, sometimes as many as a hundred in number. These basalts have been ejected in the Tertiary period by volcanic eruptions; the scoriaceous crusts and the undulations of the lava are still visible. The thickness of the basalt formation cannot be determined exactly, but it can hardly be less than 9800 feet. The effects of erosion in the basaltic regions may be easily studied; the formation of valleys of erosion may be followed step by step, for the different stages can be observed close together. The basalt is divided into two formations by deposits of lignite of Miocene age. Here are found, in strata of clay, the remains of a considerable vegetation having an American character; at the time of its growth the temperature must have been the same as now prevails in the north of Italy. The lignite is found at different levels in different parts of the island, owing to fractures and subsidences, and hence is a guide to the study of faults. It may with great probability be assumed that Iceland in the Tertiary period was connected with Europe and America, and that it is the remnant of an extensive land surface.

Liparite occurs here and there but only in small patches and dykes, its brighter colour contrasting strongly with the black basalt; there are many varieties. Granophyre also, which outwardly is indistinguishable from granite, is also common, and in the south-eastern part of the island gabbro has been found. Three very interesting streams of liparite lava were discovered by Herr Thoroddsen in 1889 on Torfajökull, in which the transition from liparite to obsidian and pumice could be seen in all its stages. The central parts of Iceland are occupied by palagonite tuffs, composed of fine tuffs and coarse breccia, ashes, and rubbish ejected by old volcanoes. In this formation branching dykes of basalt and intrusive masses are common. As a rule the palagonite tuff seems to be of more recent origin than the basalt.

The glaciers of Iceland cover an aggregate area of 5200 square miles. The climate is peculiarly suited for the development of large glaciers, for the air is keen, cold, and damp. On the south-east coast the rainfall is considerable, and here lies the great Vatnajökull, 3100 square miles in

area. The humidity on the coast is much greater than it is up the country, as is shown by the height of the snow line. On the south side of Vatnajökull it descends to 1970 feet, while on the north side it is 4270 feet above the sea. The Breidamerkurjökull glacier advances on the south to 65 feet above the sea, whereas the lowest glacier on the north terminates at an altitude of 2500 feet. In appearance the large glaciers of Iceland are similar in type to those of Polar lands. The highest summits of the country are covered with level or slightly undulating snowfields, from which comparatively few, but very broad and large, glaciers descend; the Dyngjujökull has an area of 1550 square miles. A peculiarity of the country are the so-called *jökuhlaup* or glacier falls, which occur during eruptions of the ice-covered volcanoes. On these occasions the sandy tracts below the glaciers are flooded and converted into a raging sea full of floating fragments of ice. The flood carries with it a large quantity of *débris* which within historic times has filled up several fjords and small bays, so that promontories formerly stretching far into the sea now rise above the sterile sand. These catastrophes have often caused great destruction, as during an eruption of Öræfajökull in 1350, when forty dwellings and two churches were swept into the sea.

During the Glacial Period Iceland was entirely covered with an ice-cap to the depth of over 3000 feet. In various parts of the country Herr Thoroddsen has found conglomerate of an age slightly older than the Glacial Period, which probably corresponds to the *Nagelfluh* of the Alps, and is a proof of a considerable rainfall at that time. In the central parts of Iceland are doleritic lava streams which have evidently been scored by ice and worn by glaciers of the Glacial Period. Certain volcanoes, as the Snæfellsjökull, have been active both before and since the Glacial Period. On the north coast occur strata resembling the English Red Crag; among the shells it contains are many American types which would seem to indicate that the system of sea currents round Iceland was much the same as at the present day.

In Iceland many traces exist of a negative displacement of the coast in post-glacial times, especially in the north-western part of the island. Here are found beach-lines and terraces, shells, walrus bones, and old driftwood at some distance from the sea; there are also huge caverns which have been excavated by the surge at high water. In the north-west the beach-lines occur at two levels, at 230-260 and at 100-130 feet above the sea respectively. In the low-lying lands of South Iceland there are massive clay formations containing *Yoldia arctica* which correspond to the higher beach level, and heaps of shells are also found 100-130 feet above the sea with a fauna similar to the present. At the end of the Glacial Period all the low grounds of Iceland were covered with water, and since then the sea has continually receded.

Large areas (4300 to 4600 square miles) in the very centre of the island are covered with lava of recent origin. The higher lava fields are almost entirely devoid of vegetation, and present a most dreary appearance. The most extensive lava desert is the Odadahraun, to the north of Vatnajökull, which covers an area of over 1540 square miles, and lies

2000 to 4000 feet above the sea. Its volume is probably more than 51 cubic miles, and it has been formed by the ejectamenta of 20 volcanoes. In the summer of 1884 Herr Thoroddsen spent five weeks in exploring this lava desert, travelling across it in all directions, and climbing most of the mountains. It was very hard work, but fertile in results, for, until then, this lava field was almost unknown. The usual definitions of volcanoes do not apply to those of Iceland. The common form, a conical mountain with alternate layers of lava and ash, is not very frequent, though it does occur. Dome-shaped lava volcanoes with gentle slopes (1° to 8°), like those of the Sandwich Islands, are numerous, such a one being the Trölladyngja, which has a height of 4890 feet and a diameter of 9¼ miles. The most common form of eruptive orifices is a row of low craters formed along a cleft in the earth; some of these extend for a distance of many miles. Occasionally the lava flows out of the fissure to either side without forming a volcano or crater.

Since the colonisation of Iceland in the ninth century, more than twenty volcanoes have been in a state of activity, but the records of the earlier centuries are scanty, and much information has been lost. Hekla and Katla have displayed the most energy, the eruptions of the former numbering twenty-one and of the latter twelve. Many of them caused great destruction of life and property. The greatest eruption of historic times was that of Skapta in 1783. The consequences were awful; half the cattle of the island were killed, 80 per cent. of the sheep, and 77 per cent. of the horses; 9300 persons, or about a fifth of the entire population, perished in the next two years from famine and disease. The ashes thrown out by the volcanoes have often covered large tracts, and have not infrequently been borne across the ocean, as, for instance, after the outbreak of Askja in 1875, when they reached Stockholm.

It was formerly believed that the volcanoes of Iceland were associated exclusively with the palagonite breccia, but such is not the case. Herr Thoroddsen has examined many small volcanoes on the Faxafjördur which have forced their way through basalt. Like all other volcanoes, those of Iceland are connected with fissures, and Herr Thoroddsen's explorations have shown that the volcanoes in the central part lie along a great curve running right across the country. During a journey in 1890 he found that the volcanoes of the Faxafjördur are ranged in a semi-circle round the gulf, and are connected with lines of fracture, as are also the warm and carbonic acid springs. The Faxafjördur is a large caldron-shaped fracture.

The blown sand covers in many places considerable areas; the hollows in the lava streams are often filled with fine volcanic ash, but the most common kind of blown sand is produced by the weathering of palagonite tuff. The palagonite dust forms in the low grounds and valleys new strata, which are often full of stalks of plants, and are called by the people *mohella*. On the inner plateaus the storms are very violent, and attack the rocks with considerable effect, blowing sand and rubbish over them, so that large surfaces of rock look as though they were pock-marked. Dry glacial clay and pumice dust sometimes also contribute their share to the accumulations of sand.

Warm springs are scattered in hundreds over the whole island, and are closely connected with the conformation of the country. Carbonic acid springs occur on the Snæfellsnes peninsula, while solfataras are found in the central parts, where active volcanoes still exist. Near the solfataras there is also a number of boiling mud caldrons of various colours. Nowhere in Iceland are such fine solfataras as those in the Kerlingarfjöll near the Hofsjökull, discovered in 1888 by Herr Thoroddsen. The Kerlingarfjöll Mountains are composed of a light-coloured liparite, and in their northern part are full of clefts and small valleys, where all the rocks are saturated with sulphurous steam. Jets of steam shoot out of every cleft, puffing and groaning like locomotive engines, pools of mud are boiling on all sides, beneath the earth a low rumbling is heard, and the ground shakes beneath one's feet. Not a trace of vegetation is to be seen, but the rocky walls are brilliant with every shade of colour, produced by the chemical action of the sulphurous steam. Care must be taken in walking, for in many places the boiling mud is covered by only a thin crust.

In conclusion Herr Thoroddsen said a few words on the inhabitants of Iceland. They are, of course, of Norse origin. The first colonisation began in 874, and by the year 930 about the same area was occupied as at the present time. Most of the settlers belonged to aristocratic families in Norway who were discontented with the rule of Harald Haarfager. An aristocratic republic was founded, which lasted until Iceland was united to Norway in 1262; in 1389 both countries were annexed to Denmark. In old times the Icelanders carried on an independent trade. In the fifteenth century the commerce was in the hands of the English, and in the sixteenth of the Germans. In 1602 a Danish monopoly was introduced which led to the commercial ruin of the country, and in 1854 free trade was established. In 1874 the Icelanders obtained a free constitution of their own. The legislative power is in the hands of the king and the *Althing* in Reykavik; there is a minister for Iceland at Copenhagen and a Governor-General is at the head of the administration in Reykavik. The country has made great progress in recent times. The people are sturdy, and have not allowed the hardships they have endured to crush them. As the furthest outposts of civilisation in the Polar seas they have always had to fight a hard battle with the severities of the climate. They are of an earnest, quiet, and somewhat melancholy disposition, and as a rule are very intelligent. Though the lower classes live in very poor circumstances, they are very enlightened; perhaps in no other country in Europe are so many books, in proportion to the population, printed and sold as in Iceland. The number of inhabitants is 70,000, and the island contains five printing establishments, from which issue ten newspapers and eight periodicals. The Icelandic literature of ancient times is famous, and the island was a storage place for the treasures of German literature; even amidst the unfortunate events of later centuries the appreciation of literary work never quite died out. The art of printing was introduced in 1530, and ever since the presses have worked continuously. In this century Iceland has produced several noted poets and scholars, particularly students of language and history.

A number of Icelandic poems have been translated into German. During recent decades many Icelanders have emigrated to America, and have founded flourishing colonies in Manitoba. In all about 12,000 have crossed the Atlantic, but of late years the emigration has fallen off.

About 60,000 of the inhabitants live by cattle and sheep feeding. A large part of the slopes and river valleys of the plateaus afford excellent pasture for sheep, and in the low-lying lands are extensive meadows which, properly managed, could support twice the number of cattle that now graze on them. The island now contains about a million sheep and 20,000 cows. A great deal has been done latterly to improve the soil. Many agricultural societies have been formed, and there are now four agricultural schools. At one time a little barley was grown, but it could not be made to pay, and therefore field cultivation has been abandoned. Horticulture, on the other hand, makes great progress, potatoes, cabbages, and rhubarb thrive well, and some berries, such as currants, are cultivated. Woods have never existed on the island since the Glacial Period, and the brushwood of birch is less extensive than formerly owing to the sheep. The birch (*Betula intermedia*) is seldom higher than a man, though in one place on the eastern side some specimens attain to a height of over 30 feet. The mountain ash reaches the same height.

The fishing-grounds around the island are frequented by English and French boats. The sea is very stormy, and therefore fishing is best pursued in large and strong vessels. The fishermen of Iceland have had to content themselves with small open boats, and they brave the billows of the ocean in winter with the greatest boldness and contempt of danger, and every year many of them lose their lives. Want of capital has prevented them from acquiring large vessels, but considerable progress has taken place in this direction, and the Icelanders now possess a fair fleet of fishing smacks.

As Iceland lies on the borders of the habitable world, the struggle between man and nature is there exceptionally keen, and social life is much more dependent on nature than elsewhere. The fluctuations in the material condition of the people stand in close connection with the periodical changes of climate, with the drift ice, etc., and as Iceland possesses an unusually complete and detailed history, the effects of the internal and external factors on the life of the people through several centuries may be conveniently and profitably studied.

NOTES ON TUAT.[1]

In France the name of Tuat is now in every one's mouth. Hitherto no Frenchman has succeeded in gaining access to this much coveted oasis, owing to the religious fanaticism of the inhabitants and their dread of being annexed by France. But this feeling is sure to die out, for the natives of Tuat who migrate yearly to Algeria in search of employment enjoy the most unrestricted privileges, including polygamy and the right of possessing slaves which is inseparably connected with this custom. As to annexation, every one who comes from Tuat to Algeria must soon be convinced that it is a thousand times better to live under the French Government than under the shadow of the green banner of the Sultan of Morocco. Under the former administration there is no arbitrary taxation, no extortion on the part of the officials, no execution or other punishment without regular trial.

Tuat lies to the south of the province of Oram, and therefore in the *Hinterland* of Algeria. It is separated from this territory by the Erg, or sandy region, and is situated between 26° and 30° N. lat., and between 0° and 3° E. long. Its length is about 250 miles, while its breadth varies from half a mile to nearly 40 miles. It is not one continuous oasis, but is intersected by belts of desert land. This country was known to the Romans, for Suetonius Paulinus crossed the Atlas and reached Wed Gher (Pliny v. 1)—a name still extant. In 1352, Ibn Batutah visited Buda, one of the most important places in Tuat, and later Arab writers make mention of the country, but in more recent times it seems to have been almost unknown to geographers. It is not mentioned in Ritter's *Erdkunde*, and even Barth simply speaks of meeting some of its inhabitants in other districts. Colomb, in 1857, and Colomieu and Burin in 1860 reached the threshold of the country, but were refused admittance to the villages, and Paul Soleillet penetrated to Tidikelt. Of travellers of other European nations, Major Laing deserves to be mentioned, who, in 1826, visited Tidikelt and determined the position of In-Salah, thereby making this village a starting-point for all future surveys. But Herr Gerhard Rohlfs alone has hitherto succeeded in traversing the whole oasis from north to south. This journey he accomplished in 1864, returning through In-Salah and Tidikelt to Tripolis in the following year. Since then many books have appeared in France dealing with Tuat, but none which adds anything to our knowledge of the country.

When the term Tuat is made use of in the northern countries of Africa and in the Sudan, it is applied to the whole group of oases, including Gurara, Tuat proper, which lies along the river Msaud, and Tidikelt. In the country itself, however, Gurara and Tidikelt are looked upon as distinct oases. Some of these oases lie begirt with sand around a salt lake, as is the case with Gurara, while others are situated in, or beside, a river bed, such as the Wed Saura and Msaud. There is no stream visible on the surface, but the water trickles through the ground and soaks it, so that by digging up the soil a pit may be made with one

[1] From an article by Gerhard Rohlfs in *Globus*, Bd. lxiii. No. 17.

or 2 feet of water in it. In Tidikelt, on the other hand, the oasis is entirely watered artificially by underground channels, half a mile to a mile long, or more, carried down from the plateau of Tademait. It is singular that these bring down a large quantity of water from the edge of Tademait, here called Jebel Tidikelt, whereas the rest of the plateau slopes to the north and sheds its water to the Wed Mia. When the natives of Tuat (the whole group of oases) say that rain never falls there, the statement must be accepted with caution.

The aborigines of Tuat are undoubtedly Berbers, and belong to the Kabyle race. In some of the southern parts of Tuat proper, and in Tidikelt, Tuareg have settled. Of the other inhabitants, Arabs are the most numerous, who generally under the title of *Sherifs* have taken possession of several tracts. A third element is formed by the Harratin, descendants of Arabs and Negroes; and, lastly, we have pure Negroes, who are chiefly slaves imported from the Sudan, especially Bornu and the Hausa lands. Throughout the population there is a strong admixture of Sudanese blood, so that the colour of the skin is rather dark, and the arched Arab nose here gives place to straight ones, or flat like those of the Negroes. The people deserve their reputation for hospitality, honesty, and good faith; during the time Herr Rohlfs was among them, not the smallest article went astray. Almost all the people are fakirs of the order of Mulai Thaib in Wazan, and yearly give about £2000 in alms to the *Sherifs* who wander through the country provided with letters from the Grand *Sherif* of Wazan.

Opium-eating is practised to excess, and the poppy is cultivated in large quantities in the northern part of Tuat proper. Tobacco also is both smoked and taken in the form of snuff, the chief mart for this article being Sali, in the south.

Very singular are the fat women, particularly at In-Salah. At the age of twenty they are sometimes so stout that they are unable to rise and move about. They are fed on camel-milk and butter, and shut up in small rooms until they acquire the degree of obesity that is considered to constitute the ideal of female beauty.

Deporta and Pouyanne have given the population of Tuat at 290,000 souls, basing their estimate on the number of guns or of houses. Herr Rohlfs does not venture to give any precise number, but remarks that Tuat, Gurara, and Tidikelt are most certainly over-peopled, as the strong tide of emigration which sets in every year to Algeria and Morocco conclusively proves.

Chief among the products of Tuat is the date. Though less finely flavoured than those of Tafilet, and less cheap than those of the Wed Dra, it can scarcely be asserted that the dates of the country are unsuited for export. Though the choicest varieties do not grow here, there are two kinds which would probably find a market in Algiers and Europe. Their names show that they have originally been planted by a Berber race, for they are all in the Shellach language. It may be remarked that the dates improve in quality as we proceed westwards. Those of Tafilet and Dra are superior in aroma and sweetness to those of Tuat, which, in turn, surpass those of Tunis and of the Tripolitan oases.

The palms of Tuat are of low height, but yield better timber than those of the western oases. Of cereals, barley, wheat and *sorghum* are cultivated, and the last yields two crops annually. But the corn is by no means sufficient for the wants of the people, and has to be supplemented by importation from the French Tell. Pomegranates and grapes are the only fruits that grow, and they are poor, for the climate is too hot for them. In winter, turnips, beet, cabbages, gourds, cucumbers, onions, and garlic are cultivated; in spring an excellent bean ripens, and melons and parsnips also come to perfection. Cotton thrives well in the gardens, and is extensively used. Senna and henna are found everywhere in a wild state, and the *kranka* (*Calotropis procera*) is converted into charcoal for the manufacture of gunpowder. There are no forms of animal life peculiar to Tuat, unless they exist among the insects. Sheep, which are brought from the north, lose their wool in the second year and grow hair instead. There are no cattle and but few horses, and these, like the asses, are fed on dates.

The climate is one of the hottest in the world. No mean temperatures have been obtained, but the following observations will show what great heat prevails in the oases. On August 14th, 1864, the thermometer rose indoors to 97° F., and on the 15th to 100°, at half-past one o'clock in the afternoon. This was at Brinken. At Adhrar in Timmi (Tuat), on August 20th, the shade temperature was 107° at the same hour. On the 25th the thermometer marked 73° before sunrise and 98° at noon. At Ksor el Arb, In-Salah, on October 5th, a thermometer which had been exposed during the night stood at 75° before sunrise, and in the afternoon at 86° in the room. The rooms were all open to the free air. This great heat gradually abates in November, and then a relatively cool season comes in.

It is singular that, though the natives of Tuat have the Mohammedan lunar year, they employ the European mode of reckoning in speaking of agricultural work. They say, for instance, that the first date harvest is in *Ktobr*, and that wheat must be sown in *Fefrair*. These, and the names for the other months, which are also variations of European forms, are in use throughout the Sahara, and are, doubtless, relics of Christian times.

Tuat is a perfectly flat country, sharply defined on the west by the Wed Saura, which at Tasfut assumes the name of Wed Msaud. To the east the oases run out more or less into the desert, and sometimes are completely isolated. Tuat proper is closely restricted to the Wed Msaud. Beginning at the north, we first come to Gurara, with its numerous *ksors* (villages usually surrounded by a wall), and its capital Timimun, the chief market of the oasis. Then follows Sua, with Hogerut (Augerut) on the east, and still further south the oasis Ofran, with only two *ksors*. Turning here westwards, we come to Tsabit, and, to the south of it, to Sba, while somewhat to the west lies Buda. To the south-east again lies the large oasis of Timmi, and the town and oasis of Tamentit. These are succeeded by Bu Faddi, Tasfant and Romeneff, isolated settlements. Then at Tenorobin we enter Tuat proper, where the *ksors* closely follow one another along the Wed Msaud, ending with Ksor Taurirt.

The most important places in the whole country are Timimun, Tsabit, and Tamentit. The first two are especially noted for their trade. As for Tamentit, it is one of the most remarkable towns in Tuat. With its surrounding palm-trees, it constitutes politically an independent oasis, ruled by the *Jemma* and its sheik. One of the oldest centres in Tuat, it was formerly, like many other places in the country, inhabited by Jews, who on the invasion of the Mohammedans were forcibly converted or exterminated, so that now not a single Jew is to be found in the whole of Tuat. Those of the present inhabitants who say they are descended from Jews exhibit no traces of their origin in their features, for the Negro blood in their veins has made them as dark as their neighbours. They inherit, however, the activity and industry of their forefathers in trade and handicrafts, such as those of the shoemaker, tailor, armourer, and locksmith. Tamentit contains probably about 6000 inhabitants, and has a *kasbah* (official quarter), five mosques of no architectural pretensions and without minarets, and several long lanes lined with shops. The most noteworthy object in the town is, in the eyes of its inhabitants, a stone, said to have fallen from heaven, which lies in the court of the *kasdah*. It is black, and about 20 inches in diameter, and is, no doubt, a meteorite.

Beyond Taurirt the oasis ends in a *sebkha*, and we here turn to the north-west to visit Tidikelt, the nearest oasis of which lies at a distance of some 30 miles. Thence a route through the forest brings us, after a journey of 60 miles, to In-Salah. The so-called wood consists of low bushes only, but these show that there is water at no great distance from the surface. In-Salah is situated at 27° N. lat., and from here the route to Timbuktu is provided with water over half the distance. Hence the efforts that the French are making to obtain from Morocco a rectification of their frontier towards the south-west of Algeria.

OBITUARY.

THE members of the Royal Scottish Geographical Society are amongst the many who will mourn and miss their late vice-president, Sir William Mackinnon, Bart., C.I.E., of Loup and Balinakil, Argyllshire, and Strathaird, Isle of Skye, who died in London on June 22nd, after an illness of several months. Although his death was not unexpected, it came as a blow to all who had intercourse with him and opportunities of knowing his great powers, either as founder of the British India Steam Navigation Company, as chairman of the Imperial British East Africa Company, as a staunch and liberal Free Churchman, or not less as a kindly and thoughtful host, either in his rooms at the Burlington Hotel, at Balinakil, his home in Argyllshire, or on board his yacht *Cornelia*.

Sir William Mackinnon was the youngest son of Mr. Duncan Mackinnon of Campbeltown, where he received his early education and began business. He soon, however, went to India to join his friend, the late Robert Mackenzie, with whom he founded the firm of Mackinnon,

Mackenzie & Co. Some time afterwards the great commercial undertaking, the British India Steam Navigation Company, with which his name will always be associated, was started, with one steamer running between Calcutta and Rangoon. It rapidly increased under his skilful management until now it has perhaps as large a tonnage afloat as any of our merchant fleets, and it has helped to develop or originate the great trade which now exists around the coasts of India, Burma, the Persian Gulf, and East Africa. All Anglo-Indians of note recognised and esteemed Sir William as one who had done much to consolidate the British Empire by fostering trade with all parts of the world; and when Sir Bartle Frere sent Sir Lewis Pelly to the Persian Gulf he said, "Look out for a little Scotsman called Mackinnon; you will find him the mainspring of all the British enterprise there."

As an instance of his large-heartedness it may be mentioned that at the time of the Orissa famine, when the agents of the company had made a favourable contract with the Government for the conveying of rice from Burma, Mr. Mackinnon, on hearing of the terms, cancelled them and gave orders that the necessary food should be carried at less than the ordinary rates. Sir William did not confine his interests and activities to India and shipping, but, like other energetic Scotsmen, helped to enlarge Britain's dominion by land as well as by sea. The greatest scheme of this kind with which his name is connected was the founding, in April 1888, of the Imperial British East Africa Company, of which he was chairman, not only in name but in reality. As early as 1878 he had opened up negotiations with Sultan Burghash for a most valuable concession, leasing the whole of the territories of the mainland which extended along a coast-line of 1150 miles from Tunga to Warsheik, but the government of the day did not see fit to sanction the concession, and so it became one of Britain's lost opportunities. When the charter was at length obtained, other European powers had begun the scramble for Africa, and Britain then only obtained a share. Since then the company has discharged imperial duties without imperial aid, for the necessary capital was almost entirely subscribed by Sir William Mackinnon and his friends, and when the evacuation of Uganda was threatened he gave other £8000 to prevent the loss of so fine a tract of country to the Empire.

Sir William Mackinnon it was who started the idea of an Emin Relief Expedition, and sent H. M. Stanley, to whom he was always a firm friend, at its head, hoping to aid the cause of Christianity, civilisation, geography, and commerce by opening up "Darkest Africa." He and his friends again came forward with the necessary funds for the enterprise.

Another of the means by which he did something for the Dark Continent was the founding of the Industrial Mission at Kibwezi, British East Africa, known as the East African Scottish Mission, and successfully established in 1891 by the Rev. Dr. Stewart of Lovedale, who, at Sir William's request, went out in charge of the mission party. Sir William Mackinnon was married in 1856 to the eldest daughter of the late Mr. Robert Jameson of Glasgow, who survives him. He was created a baronet in 1889. He was buried at Clachan, Argyllshire, on June 28th, and, although no invitations to the funeral were issued, hundreds followed his

remains to the grave, many coming from London and other parts of the Kingdom. He will always be remembered as an imperial-minded and patriotic Scotsman, who was ready to help on every good enterprise, and who showed his practical interest in geography by originating the Emin Relief Expedition and using his great influence to advance our own Geographical Society as opportunity offered.

GEOGRAPHICAL NOTES.

By W. A. Taylor, M.A., F.R.S.E.,

Librarian, R.S.G.S.

EUROPE.

Etna and Vesuvius.—Dr Johnston Lavis writes under date June 19th :—"It may interest you to know that, after several years during which Etna has been in a solfataric state, lava has again risen up into the crater, a condition rather exceptional in this volcano. Earthquakes continue in the north of Sicily, but the flanks of Etna are remarkably quiet.

"On a visit to Vesuvius less than a month ago I found that little change had taken place for many months. Lava still oozes out of the opening at the base of the great cone, in the Atrio del Cavallo, and has in the last two years formed a boss at least 160 feet high, sloping away in all directions. The central crater still continues to increase slowly, and is nearly always in an ash-forming state."

AFRICA.

The Sahara.—The *Comptes Rendus*, Nos. 10 and 11, contain reports of MM. Méry and Foureau on their missions to the Azjer Tuareg, the object of which was to obtain a free passage for caravans through the territories of these tribes to the Western Sudan. On December 31st M. G. Méry left El Wed, and passing through Hassi Meyi, the most advanced French post, marched by the *gassi* of Sjert Brahim and Bel Haïrane to the bed of the Igharghar. This channel, through which a majestic river must have flowed in prehistoric times, now forms a natural highway entirely free from sand and covered with gravel of bright and varied colours. For nine days the mission followed the Igharghar without finding any water, and arrived at the *hammada*, or rocky plateau, of Tinghert, where the channel is enclosed by high cliffs of chalk. Then the route from Rhadames to In-Salah was followed, the mission arriving on January 22nd at Temassinin, a place little known, but of considerable importance owing to its geographical position. It lies on the route followed by the few caravans which travel between In-Salah and Rhadames or Rhat, and is a halting-place for Hoggar or Azjer Tuareg in their journeys from east to west. The oasis, which contains the tomb of a highly venerated marabout, Si Mussa, supports about 200 palm trees watered by a limpid spring. In the neighbourhood, for a distance of more than 30 miles, is a succession of *sebkha*, some with a bottom of marl and others covered by a saline crust and dominated by lofty cliffs. The semi-fossilised shells that abound here show that at no very distant period these *sebkha* were real lakes. Between Temassinin and the mountain Khanfus, an advanced rocky elevation of the Tassili mountains, the expedition crossed an immense assemblage of sandhills, and then, near Tebalbalet, entered a mountainous region, camping at Aïn-el-Hajaj. The aspect of the country had

completely changed. Between the mountains of Tassili on the south and the sandhills on the north run the valleys of the Ighargharen, where a large variety of forage plants afford rich pasturage to the large flocks of sheep and goats kept by the Tuareg. The hazel and the tamarisk there attain the dimensions of large trees. On February 15th M. Méry arrived at Lake Menkhugh, then dry and covered by forest; from the roots, which rise to some distance above the ground, the height of the water during the rainy season may be ascertained. Having brought his negotiations with the Azjer chiefs to a successful termination, M. Méry retraced his steps to Tebalbalet, and took the ordinary route to Algeria across the dunes of Taïba.

M. Foureau travelled by Aïn-Taïba, Muilah-Mattallah and El Biodh, and, crossing the Wadi Tarfa, marched over the rocky plateau of Tinghert, from which he descended to Temassinin. From this place two routes lead to Ghadames. M. Foureau chose that passing along the edge of the Erg, which is traversed in twelve days. Tabankort and Tin-yagghin lie on this route. The ground is calcareous rock, and the vegetation on the sands of the Erg on the north is very dense along the latter half of the march. Antelopes are very plentiful. At Hassi Imolei, near Ghadames, M. Foureau had an interview with some Azjer chiefs, who seemed favourably disposed towards the French. There is no traffic between In-Salah and Ghadames, and little of importance between Aïr, the Tsad region, and the Mediterranean. From the camp near Ghadames the expedition marched northwards through a tract of sandhills, 650 to 1000 feet high at first and gradually sinking to a height of not more than 230 feet. In eight days and a half they arrived at Hassi Tuïza, 200 miles from Ghadames and six days' march to the south of Tuggurt.

The Shari.—A long report by M. Maistre on his expedition from the Mobanghi to Yola is published in the *Bull. du Comité de l'Afrique Française*, No. 6. M. Maistre followed for some distance the course of the Tomi, an affluent on the right bank of the Kemo, and has laid down its course fairly accurately up to the latitude of a village called Amazaga. According to the natives it rises in a large group of mountains, which was pointed out to the traveller, in the Bolo country, about eight days' march to the west of Amazaga. This group is probably of great hydrographical importance, giving birth to several large rivers, the Nana and Bahar Sara, which flow northwards, the Ombela, a tributary of the Mobanghi, and, perhaps, also to some tributary of the Sangha. Farther north, near Yagussu, the chief village of the Awaka, the expedition struck the river Gribinghi, which it followed for more than 60 miles, carefully surveying its course. It flows from the east to Yagussu, and then turns northwards to meet the Ba Minghi at Manjatezze and form the Shari. These two branches run nearly parallel to one another, and, from information obtained from the natives, M. Maistre identifies them with the Bahr el Asrek and Bahr el Abiad of Dr. Nachtigal. The Gribinghi or Bahr el Asrek may also, he thinks, be the Kukurru crossed by M. Dybowski before arriving at Mpoko. The Arab names for these rivers are unknown in the country. Marching then north-westwards, the expedition passed through Kasinda, and shortly before reaching Daï crossed the Bahar Sara, which flows from south to north, and drains the marshes that lie between these two villages. The Bahar Sara is probably the Bahar Kuti of Nachtigal, though it does not flow from the east, but nearly along the meridian, rising at about 6° N. lat. In the country of the Manjia, south of Yagussu, M. Maistre heard of a river called the Kossina, probably identical with the Bahar Sara, flowing at a distance of six days' march to the west of his route. Still farther westwards lay another stream, the Vuni, pro-

bably a tributary of the Logone. On the question of a connection between the Shari and Logone, spoken of by Barth and Nachtigal, M. Maistre obtained no definite information. He is inclined to doubt the existence of such a communication, though in a country of plains and marshes it is possible when the water is high. Beyond the Logone the expedition reached the western boundary of the Lake Tsad basin, and then crossed a small stream, the Kan, one of the tributaries, no doubt, or the upper course of the Mayo Kebbi. He confirms the opinion recorded in vol. vii. p. 37, that the Mayo Kebbi does not flow from the Tuburi swamp, and that therefore there is no connection between the Benue and the Logone. At Palem M. Maistre joined the route of Dr. Nachtigal.

Between the Mobanghi and the Gribinghi the country is slightly undulating, is covered with tall grass and woods, and intersected by numerous small streams, some running southwards to the Mobanghi, and the others belonging to the Tsad basin, the watershed being formed by a large desert plateau. At 7° N. lat. commences a vast plain through which the Gribinghi flows. When the expedition crossed it, this plain was almost entirely transformed into a marsh. It extends to the Logone ; but to the west the soil changes its character, sand predominating everywhere. Except in the large rivers, water is scarce in the dry season, and the natives draw all their supply from wells. Beyond the Logone the country is somewhat more elevated, and consists of large wooded plateaus, forming the watershed between the basins of Lake Tsad and the Benue. Near the frontiers of Adamaua the country becomes mountainous. The region traversed by the expedition is inhabited by a large number of tribes almost always separated from one another by an uninhabited zone. M. Maistre enumerates ten principal tribes, which are again divided into many independent groups. Some of them are warlike and of fine physique, especially the Sara of Manjatezze and Kasinda : measurements showed that the average height of the men is 5 feet 10 in.

In general the soil is well suited for the native crops. Cotton grows nearly everywhere, but is cultivated only in Adamaua and the adjacent countries, where, with indigo, it forms the most important article of trade. In the south of Baghirmi caoutchouc is very common, as well as the butter tree. In some parts, particularly between the Gribinghi and the Logone, elephants are very numerous ; and the ivory trade would be very remunerative for many years. Small white beads are the articles most in demand, woven materials are highly valued by the Sara and the Musulmans in general, cowries pass current among some tribes, particularly in Adamaua, and red beads of imitation agate are much appreciated in the south of Baghirmi.

AMERICA.

Lieut. Ryder in Greenland.—On p. 614 of vol. viii. it was mentioned that Lieut. Ryder, after taking in provisions and water in Iceland, intended to return to the east coast of Greenland. On the 29th August 1892, the *Hekla* left the Dyra Fiord and, after running great risks from storms, fogs, and ice succeeded, on September 10th, in reaching the harbour of Tasiussak, visited by Nordenskiöld in 1883. Leaving the ship two days later with two boats and a *kayak*, Lieut. Ryder travelled northwards, visiting first Tasiusarsik, where Captain Holm wintered in 1884-5, and reaching Minatikik, the northernmost inhabited place on the Sermiligak Fiord, on the 15th. On the following day from a mountain on the little island Ananak, to the south of Leif's Island, it was seen that a thick belt of ice lay along the coast to the north, and out to sea as far as the eye could reach. In the narrow sounds also lay much ice, which is unusual at that time of year. The party were, therefore, compelled to turn back to the ship.

Lieut. Ryder made an enumeration of the Angmagsaliks, and tried to ascertain the number of deaths which had taken place since Holm's visit—a work attended with great difficulty owing to the reluctance of the natives to even mention the name of a deceased person, and to the complicated relationships. The result showed that in 1892 there were eleven settlements, containing 132 men and 162 women, or 294 persons in all, whereas Captain Holm found 193 men and 220 women (see vol. ii., p. 176). Of these 413 persons it appeared that 114 had journeyed southwards and 107 were dead.

As regards the geology of the east coast it has been found that the shore at the upper end of Scoresby Sound consists of primitive rocks, principally granite. The south coast of the sound from Cape Brewster westwards is exclusively of basalt, but in the branch to the south of Denmark Island granite appears below the basalt and rises rapidly towards the west. Sandstone is found in several places, *e.g.*, in the direction of the Werner Mountains and on Jameson's Land. The latter, to judge from the slight knowledge of it obtained by the expedition, is chiefly of morainic formation, but at some spots, as on the east coast, are found strata of sandstone, slate, limestone, and basalt. The limestone of Cape Stewart contains a quantity of fossils—ammonites, belemnites, gastropods, lamellibranchs, and brachiopods, belonging to the Jurassic formation, and in the slates fossil plants occur. The Liverpool Coast consists of granite, but the coast to the south of Cape Brewster exclusively of basalt.

Polar bears, foxes, reindeer, musk oxen, hares, lemmings and various kinds of seal were observed in the neighbourhood of Scoresby Sound. Thirty-two kinds of birds were seen; the barnacle goose breeds here, and the bean goose, which has never before been found in Greenland, is plentiful. Few fishes were obtained: the most interesting was *Cottus quadricornus*. A number of new *Bryozoa* were brought up by the trawl-net. 160 varieties of flowering plants were collected, of which about the half have never been obtained before on the east coast. This collection is of importance with regard to the questions what proportion of the existing flora of Greenland lived through the glacial period, and whether the flora is of American or European origin. At Scoresby Sound the flora appears to contain a large number of American forms.—*Deutsche Geogr. Blätter*, Bd. xvi. Heft. 1.

OCEANIA.

The Pelew Islands.—This group, belonging to the Spanish administrative province of the Carolines, lies between 6° 51′ and 8° 3′ N. lat., and between 134° 13′ 21″ and 134° 42′ 21″ E. long. It is composed of six inhabited islands, four uninhabited, and some 50 small islets, besides a large number of rocks rising out of the water. The whole group is surrounded by a coral reef about 130 miles in length, and an inner reef not more than 60 miles long fringes the coasts. Of an aggregate area of 189 square miles, 116 fall to the share of Bab-el-daop (Baobeltaob). This island is for the most part mountainous, some of its summits reaching an elevation of about 2000 feet. One of the supreme chiefs of the Pelew Islands resides here, and the other on Arclildeu or Goreor (Korror), lying to the south of the former, where, in 1891, some Spanish missionaries took up their residence. One of these, Fray Antonio de Valencia, has drawn up a report of the islands, which is published in the *Bol. de la Soc. Geográfica de Madrid*, tom. xxxiii. Nos. 4-6. The surface, he says, is very rugged, some of the uninhabited islands being nothing else than a mass of rocks. Several basalt cliffs rise above the bays, and at their feet and over the bottom of the bays, as well as round the whole coast, madrepores grow in enormous quantities, appearing with their varied forms and tints, when the

water is quiet, like beautiful gardens. Some perennial streams exist, but are naturally of no great importance. The two largest are on Bab-el-daop, one of which drains a lagoon in the interior some 2 miles long. There are also numerous brooks, some of which contain water all through the year, and springs of excellent water. The temperature is, on the whole, very equable ; it is lowest in February and March and during the continuous rains of summer. The highest recorded temperature was in October, when the thermometer rose to 91° F. in the day, and sank only to 84° in the night. The absolute minimum, on the other hand, was 77°. Storms are not uncommon, but are scarcely ever accompanied by thunder. Earthquakes very rarely occur, and are very slight.

Of animals, the islands possess domestic pigs in great quantities, goats, dogs and cats, and rats. There are four species of snakes of no great size and quite harmless. Alligators are said to haunt the streams, but they must be very small. Newts are plentiful, but iguanas, which are found in the Carolines, do not exist here. Fowls, half-wild, are abundant, and wood-pigeons, a kind of blackbird, wood-cocks, and a species of ostrich (perhaps the author means the emu) inhabit the islands, besides birds resembling the quail, white turtle-doves, and small swallows. Storks and ducks frequent the waters, and owls and bats are also common. The fishes are of various species, and of good flavour ; there are several kinds of shell-fish, and turtles are particularly abundant. The flora of the islands is luxuriant, and very similar to that of the Philippines. Woods containing an infinite variety of bushes, plants, and trees, many of them furnishing timber suitable for building, descend to the very edge of the water, and lianas, large and strong enough to be used in the hauling of trunks, hang from the trees. In the interior there are large plains covered with close grass, which is capital fodder for cattle. Though the soil must be very fertile, there is no great variety of fruit-trees. Bread-fruit, coco-nuts, oranges, and limes are abundant, and a kind of chestnut and a tree resembling in its fruit the almond are also found. To these must be added bananas, pine-apples, and sugar-cane. Tobacco would grow well, but it is not cultivated, nor are rice, maize, sweet potatoes, and gourds, though experiments made by the missionaries show that the ground is well suited for them.

The only articles of export are *copra*, sea-cucumbers, tortoise-shell, and mother-of-pearl shells which are used as currency in Yap. Sea-cucumbers are very plentiful, and are fished for chiefly by men sent from Yap by two commercial houses in that island, the natives paying little attention to this source of profit. The men of the Pelew Islands are, nevertheless, very industrious, and construct elegant canoes, which they paint and otherwise adorn with some degree of taste. They are also skilful in the carving of wooden jars, basins, plates, and other utensils, incrusted with mother-of-pearl. Out of tortoise-shell they make small trays, spoons, rings, and bracelets. Cord and nets are manufactured from coco fibres, the leaves of the *Pandanus* and other plants. The people are of the Malay race, though the type is not very pronounced. They are strong and well formed, of medium height, with large black eyes and hair, in general, smooth. Some of them have large and handsome beards. Their number is, perhaps, about 3000, of whom 500 live on Goreor. Fray Antonio cannot decide to what family the language should be assigned, for it appears to have little similarity to Malay, Chinese, or any language spoken in the Philippines. It is fairly rich in expression, and its construction is not difficult. The system of notation is decimal, and the natives can count without much difficulty up to 1000. Accounts involving large numbers they keep on knotted cords, as the Incas were wont to do. The natives are polytheists, and have great faith in incantations and necromancy. They believe in the existence of an immaterial soul, which, they suppose, is able to leave the

body for a time and return to it again. It is in this way that they explain dreams. The currency consists of stones of various forms and colours, having fixed values and constituting a regular monetary system. The most valuable are of the form of a section of an orange with the points removed, and are yellow or red with dark specks. False stones, which strangers have sometimes tried to pass into circulation, have been immediately detected. The principal food of the islanders is a root, which is cultivated by the women. (Probably Fray Antonio means *taro*.) Fish, shell-fish, and pork are also eaten, as well as bananas and the other fruits of the country.

The villages are intersected by lanes, the chief of which are broad and paved with large stones. The houses have a wooden framework well put together, and low walls of cane and *Pandanus* leaves, and are crossed by beams of wood so low that a man must stoop to pass under them ; the roofs are high and pointed, and thatched with leaves of the *Nipa* palm. The number of doors marks the rank of the occupier, and only the king's residence can have the floor and walls entirely of wood, while in the houses of the common people the floor must be of cane. The woodwork is adorned with carvings of human figures, animals, etc. The men wear nothing but a cloth round the loins, and the women an apron of grass and leaves. The hair is gathered up at the back of the head, and, among the men, is fastened with a wooden comb. The ears are pierced at the age of six or seven years, and adorned with pendants of tortoise-shell. Flowers and odorous herbs are also worn in the ears. Tattooing is in general use as an ornament. Every one carries with him a case containing all necessaries for smoking and betel-chewing, and sometimes a knife and spoon. Their native arms are wooden lances, with sharp barbed heads, and now fire-arms and European and Japanese swords are common among them. Wars between the subjects of the two kings have been very frequent, but appear to have now ceased. Fray Antonio gives many other details concerning the manners and customs of this people, which are very interesting but would take up too much space if repeated here.

MISCELLANEOUS.

During the year 1892 **seals** were caught in the **Caspian Sea** to the number of 142,019.—*Globus*, No. 19.

The discovery of stone axes on **Helgoland** proves that the island was inhabited even in the neolithic period.—*Globus*, No. 18.

The first **Railway in Siam**, from Bangkok to Paknam at the mouth of the Me-nam river, was opened on April 11th.—*Globus*, No. 19.

The Baltic towns, Dorpat and Dünaburg, have been re-named by the Russian authorities Yurief and Dvinsk respectively.—*Globus*, No. 15.

The Belgian Captain **Van Kerckhoven**, leader of the expedition which has lately been exploring in the Welle basin, was accidentally shot by a porter on August 10th. He reached the Monbuttu country, but whether he advanced as far as Lado seems still uncertain.

Mr. B. Thomson, Commissioner for Native Affairs in Fiji, has received from the King of Tonga a **relic of Captain Cook.** It is a fragment of red cloth, part of a piece given by the celebrated navigator to a native chief, by whose descendants it has been most carefully preserved.—*Globus*, No. 20.

The Gesellschaft für Erdkunde zu Berlin has awarded its Humboldt Gold Medal to **Dr. John Murray** in recognition of his services to science as Director of the *Challenger* Expedition Commission. This honour has been only once conferred before, namely, in 1878, when General Przhevalsky was the recipient.

Mr. T. C. Mendenhall of the U. S. Coast and Geodetic Survey, has forwarded a pamphlet on the **Determination of Gravity** by half-second pendulums on the Pacific Coast, in Alaska, etc. The instruments are described in detail, the use of a free pendulum as a true standard is discussed, and a method of determining differences of gravity by telegraphy is explained.

We are asked to make known the formation of a club entitled **The West of Scotland Rambler's Alliance.** Its object is to promote the co-operation and extension of Rambling Clubs and other societies in the West of Scotland, and to render excursions a means of education by introducing the study of botany, archæology, and other subjects. Mr. A. C. White, 67 North Bridge Street, Airdrie, is the secretary.

On 14th January, M. Sresnevsky, observer at the Meteorological Observatory in Irkutsk, recorded a **barometric pressure** of 29·53 inches. Owing to the extraordinarily low temperature on that day (−40° F.) this reading cannot be reduced to sea-level by the usual formula. M. Voeikof, basing his computation on the annual mean for Irkutsk, has found that it represents a pressure of 31·5 inches, or 1·3 inches above the annual mean.—*Globus*, No. 20.

We have received from Professor Tietze the laws of a new society, entitled the **Gesellschaft zur Förderung der naturhistorischen Erforschung des Orients in Wien.** Its objects are to render assistance to travellers visiting the East in the interests of natural history, and to promote the formation of collections ; to undertake the publication of works on the natural history of the East ; to correspond with scientists and kindred societies ; and to aid in their work natives of the East who are studying natural history in Austria.

Mr. Guy Boothby has traversed the Australian Continent from the **Gulf of Carpentaria to Adelaide,** covering a distance of 4000 miles in thirteen months. Starting from Normanton on March 2nd, his party ascended the Flinders and Gilliat rivers to the Diamantina, and thence, across the Thomson, Barcoo, Warrego and other rivers, came to Bourke on the Darling. Here a boat was obtained and a journey of 780 miles down the river brought them to Menindee, where passage was taken in a steamer.—*The Colonies and India*, May 6th.

Surgeon-General Sir William Moore, K.C.I.E., has kindly permitted us to place his opinion on **malarial production** before our readers. He holds that malaria is simply a form of chill, that it is more prevalent in tropical than in temperate climates, because in the former the changes of temperature are greater and more sudden. Marshy lands and districts exposed to inundation are the most common haunts of malaria, because they are colder and damper than other regions. Thus, in the Terai the thermometer often stands at 120°F. in the day and falls to 50° at night, often with cold winds. Again, all measures by which the healthiness of a locality is improved render the air drier and the temperature more equable, as, for instance, the planting of trees in such a position as to ward off cold winds. In fact, wherever malaria occurs, the conditions which produce chill will always be found, and the precautions by which the disease may be avoided are such as will protect from chill—proper clothing, warm and dry houses, avoidance of exposure to great heat, etc.

The **Smithsonian Institution** has made known that it will apply a portion of the donation made to the Institution by Thomas G. Hodgkins, Esq., of Setauket, New York, to be devoted "to the increase and diffusion of more exact knowledge in regard to the nature and properties of atmospheric air in connection with the welfare of man," as follows :—

(1) A prize of $10,000 will be given for a treatise embodying some new and important discovery in regard to the nature and properties of air bearing on any or all of the sciences.

(2) A prize of $2000 for the most satisfactory essay on (*a*) the known properties of air, considered in their relationships to research in every department of natural science, and the importance of a study of the atmosphere in view of these relationships ; (*b*) on the proper direction of future research into the properties and relations of the atmosphere.

(3) A prize of $1000 for the best popular treatise upon atmospheric air, its properties and relationships, written in a simple style suitable for instruction.

(4) A Gold Medal will be awarded annually, or biennially, for important contributions to the knowledge of the nature and properties of air, or for practical applications of existing knowledge of them to the welfare of mankind.

The essays should be sent in to the Secretary of the Smithsonian Institution, Washington, before July 1st, 1894, except in the case of those in competition for the first prize, which may be sent in up to December 31st of the same year. Also, should this prize not be awarded at the time, the Institution may hold it over to a later date, if it appear that important investigations are in progress, the results of which it is intended to offer for the prize.

A principal motive for offering these prizes is to draw attention to the Hodgkins Fund, and, accordingly, the circular has been sent to universities, learned societies, and men of science, with a view to elicit suggestions and recommendations with regard to the application of the fund.

NEW BOOKS.

Fragments of Earth Lore. By PROFESSOR GEIKIE, D.C.L., LL.D., F.R.S., etc. Edinburgh : John Bartholomew and Co., 1893. Pp. 428.

Professor Geikie's latest publication, *Fragments of Earth Lore*, contains a selection from the numerous essays on geological subjects which the author has published in various journals during the past twenty years or more. With the exception of some verbal changes and a few excisions, the papers are reprinted substantially in their original state.

As might have been expected, the author of *The Great Ice Age* gives us in this volume much interesting matter relating to the Glacial Period ; but although this interesting chapter of the Earth's history is discussed from several of its numerous possible points of view, the author has been content to notice only some of the broader features, and has thus found space for the republication of several essays on other branches of Geology, most of which relate chiefly to the evolution of surface features.

The first chapter is based upon the opening address to the Geology Class at the Edinburgh University in 1886. It deals mainly with the relations between Physical Geography and Geology. Like many other teachers, Professor Geikie finds it difficult to draw any sharp line of demarcation between the scientific study of Geography and that of the sister science Geology. At the same time he does not

appear to be at all disposed to share the views of those who are trying to represent Geology as a subordinate branch of that excessively compound subject Physiography ; physiographers at present hardly know where to stop.

Chapter II. deals with "The Physical Features of Scotland," and is a reprint of an article which has already appeared in these pages (*S.G.M.* vol. i. 1885). It is illustrated by a beautiful orographical map of Scotland and the areas adjoining, which is very fitly made the frontispiece to the volume. On reading the article with the map before them, those who have reached middle age cannot help reflect upon the immense strides that have been made in the teaching of Geography since the days of their boyhood.

The third chapter, on "Mountains : their Origin, Growth, and Decay," appeared in the pages of this *Magazine* the year following, 1886, and deals with the same subject in a more general manner.

The article on the Cheviot Hills, which forms the subject of Chapter IV., appeared in *Good Words* nearly a quarter of a century ago ; but it is usually recognised, even now, as the best general account of that part of Britain which has yet appeared. It may well be doubted whether there are any geologists interested in the palæozoic rocks who have not already perused these articles, and who will not be glad to see their old acquaintance reprinted in a more useful form. The same remarks apply equally to the articles on the Outer Hebrides, which also appeared in *Good Words* soon after those on the Cheviots.

Chapters VI. to X. XII. and XIII. deal at some length with some of the numerous problems which arise from a detailed study of Glacial Phenomena in various parts of the world. As Professor Geikie has long made this his own special subject, it is unnecessary to add a word of comment upon the essays in question.

Chapters XI. and XIV. will, doubtless, prove of interest to a wider circle of readers than any of the papers noticed above, seeing that they deal largely with facts that have attracted attention for many years, and the nature of the inquiry permits of the arguments being more easily followed by the reader who does not happen to be conversant with more than the broader facts of geology. The chapter on the Geographical Evolution of Coast Lines must be fresh in the memory of all readers of this *Magazine*, seeing that the article in question formed the *Presidential Address* delivered before the Geographical Section of the British Association during their meeting in Edinburgh in 1892. The subject is one upon which much diversity of opinion exists ; but, whatever view the reader may take, it will be impossible for him to study the *Address* in question without being convinced that the doctrine of the permanence of the ocean basins is destined, if it dies at all, to die a hard death.

Need it be said—seeing that the book is published by the Messrs. Bartholomew —that it is well got up. The typography is first rate ; and it would hardly be possible to improve upon the maps.

Ordnance Gazetteer of Scotland: A survey of Scottish Topography, Statistical, Biographical, and Historical. New Edition. Edited by FRANCIS H. GROOME. London : William Mackenzie, N.D. Vols. I. and II. Aan to Eynort. Pp. 288 and 272.

The first edition of Groome's *Ordnance Gazetteer* was one of which not only the editor and publisher, but the country of which it treated, might well be proud. It had no equal in fulness of detail, general accuracy, and far-reaching scope, which qualities made it an indispensable book in every Scottish Library. The first edition was published in 1885, since which time the orders of the Boundary Commissioners

have made extensive and important changes in the boundaries and areas of parishes and counties, many new public buildings have been erected in all the cities and towns, and the statistics have changed very considerably : hence a fresh issue was most desirable, and in the volumes before us all the new information procurable has been utilised with perfect judgment and balance, so as to make this edition a most valuable and important picture of Scotland, not only as it was in the past, but, especially, as it is in the year 1893. With only the first two volumes before us an extended notice is impossible. In the first edition the articles towards the close of the work lacked somewhat in detail, a fault which we hope will be remedied in the present volumes. We shall have pleasure in watching the development of Mr. Groome's great work, and need only here point out one or two instances of the care and detailed treatment which are the particular features of this gazetteer. Under the notice of such a small place as Eaglesfield, the fact that a new public hall has been opened during the present year is duly recorded, as are like changes and improvements in other places both small and great. Under Culloden we have a picture of the battle, more detailed and interesting than can be found in many histories of the '45, in which the movements of every regiment, every clan, and every officer of distinction are clearly traced from the moment when the opposing armies commenced to march upon Drummossie until the rout of the Highlanders was complete : nearly eleven columns are given to this article. We have already exceeded the space allotted to this review, and can, therefore, only mention the article on Edinburgh, extending to nearly one hundred and twelve columns, with an appended index of two pages. Too high praise can hardly be given to these volumes. Those who are best acquainted with the former issue will have the heartiest welcome for the new edition, knowing from former experience the value and interest of the work.

Geografía y Geológia del Ecuador. Publicada por Órden del Supremo Gobierno de la República por Teodoro Wolf, Dr. Phil., Antiguo Profesor de la Escuela Politecnica de Quito y Geólogo del Estado. Con 12 Laminas autotípicas, 47 Ilustraciones en el texto, y 2 Cartas. Leipzig : Tipografía de F. A. Brockhaus, 1892. Pp. xii + 671.

There is still a vast amount of work for the explorer in South America, and perhaps of no country in the continent inhabited by people of European descent has so little been known hitherto as of Ecuador. This work of Dr. Wolf's, in which he has incorporated a vast amount of scientific information culled from the works of other writers, or acquired personally during a sojourn of more than twenty years in the country, is of great value. Being primarily intended to elucidate the author's map which is noticed elsewhere, a large part of the book is devoted to a description of the main geographical features of the country. This has already been summarised in the *Verhand. der Gesell. für Erdkunde zu Berlin*, from which the notes in vol. viii., p. 221, and vol. ix., p. 207, were compiled. To the work of Maldonado, La Condamine, and Humboldt the author has added the important and extensive results of his own labours, and has given for the first time a systematic account of the configuration of the Andes and western districts of Ecuador. The eastern territory of the Republic, in the basin of the Amazons, has still to be explored. All that Dr. Wolf has been able to collect is a few details concerning the rivers, their tributaries, navigation, etc.

Meteorological observations have been taken, as might be expected, at very few places. The most complete have been recorded at Quito, and shows that the average temperature is about 56°, with a very small annual range, and that the

rainfall is about 40 inches. Storms are very frequent. The climate of Quito has long been famed as one of the most salubrious and agreeable in the world, but Dr. Wolf does not consider it superior to that of other towns and districts. Having lived both in Quito and Guayaquil, and travelled over a great part of the State, he can give no preference to any particular locality, but considers that there are few tropical countries in the world which have so fine and healthy a climate.

Part IV. contains an account of the fauna and flora of Ecuador, and in Part V. the Galapagos Islands are fully described. Of these he speaks favourably, believing that they will acquire much greater importance, owing to their position, on the opening of the Panama Canal, which he considers must be brought to completion sooner or later. There is room for a certain number of colonists, who might support themselves by agriculture, cattle-feeding, fishing, and minor industries, though the cultivable area is too small for colonisation on a large scale. An appendix contains much useful information on the history and political geography of the state, on the Indians, commerce, industries, etc., and the notes at the end of the book are full of many interesting and varied details.

The volume is excellently printed, and adorned with a large number of illustrations. We cannot understand, however, why a book of this size need be rendered still more inconvenient to handle by the use of weighted paper.

Venice: An Historical Sketch of the Republic. By HORATIO F. BROWN. With Maps and Plan. London: Percival and Co., 1893. Pp. xxiii + 434. *Price* 16s.

Venice owed its birth to barbaric invasion, especially to that of Attila in 452, by reason of which the mainland refugees decided to convert the lagoon into a home and defence. Of sheer necessity seamanship became second nature; from external peril sprang union; the Carolingian revival effected a demand for foreign merchandise; the Venetians came forward as a commercial power, and with the Crusades appeared in the "very forefront of European history." Vividly and faithfully (though, possibly, with excessive iteration) Mr. Horatio Brown represents the far-reaching effects on Venice of the sacking of Constantinople by her in the fourth Crusade from purely selfish considerations. There followed an increase of population, the creation of a rich caste and of social distinctions, an oligarchical constitution with the famed Council of Ten as executive and ruler, rivalry with Genoa for supremacy in the East and, with success, a fresh increase of population and of material needs which had to be supplied by food-producing territory such as the neighbouring principalities temptingly offered to a conqueror; and so Venice acquired a land empire, excited jealousy in Italy and complications in Europe, until the League of Cambray prepared her downfall as a Power, and forced on her the humiliation of mere existence. More: the sack of Constantinople had opened Europe to the Turk, and ultimately ousted Venice from her Eastern trade. What was wanting to complete her downfall after the League of Cambray was supplied by the discovery of the Cape route. There remained the Venice of grandeur and pleasure for both Venetian and stranger.

Accurate, displaying a sense of perspective, and combining moderation of tone with a natural and healthy enthusiasm, Mr. Brown's work ranks with the best of its class. The main facts and features are kept clearly prominent, but these do not cut off lucid expositions, commercial, constitutional, and imperial. We commend in especial what is said of the Council of Ten. Mr. Horatio Brown can be both solid (like Mr. Burd in his elaborate edition of *Il Principe*) and entertaining. The maps are distinct and to the purpose.

Lettres sur l'Inde. Par Monseigneur Laouënan, de la Société des Missions-étrangères, Archevêque de Pondichéry. Publiées par Adrien Launay, de la même Société. Paris : Librairie Victor Lecoffre, 1893. Pp. 296.

The publication of these letters, which were written during the years 1860 and 1861, has been deferred until after the death of the good Archbishop, which took place in Paris in September 1892. He endeavoured almost up to the last to continue his labours in the East, though much weakened in health from a devoted life of forty-seven years in the mission-field, and latterly suffering from loss of eyesight. Though the letters were not published at the time of writing, owing, it would appear, to their having been accidentally laid aside in the Mission Office at Paris, Father Laouënan had prepared them with great care, in the expectation that they would be given to the public, and not reserved merely for the perusal of his mission brethren, among whom they were at the time circulated. The letters form a series written during a tour of visitation to various Catholic missions in Southern India and Ceylon, undertaken under instructions from Rome by a previous bishop of Pondichéry, in whose suite Father Laouënan was included. Besides relating the circumstances of the journeys, and giving descriptions of the physical features of the country, the letters furnish many interesting particulars both of the missions, with the numbers of the converts, and of the various tribes and sects among whom the missionaries were labouring. The reverend father made a close study of the tenets of the Hindu religion, and wrote a book studying its connection with the Jewish and Christian beliefs. In the letter from Ceylon a short sketch is given of the successful labours of the Roman Catholic missionaries during the occupation of the island by the Portuguese in the sixteenth century, and of the persecutions the converts suffered from the Protestant Dutch on their conquest of the island. The Father claims that the Roman Catholic faith has survived these persecutions, whilst the Protestantism of the Dutch has disappeared.

Interesting information is given concerning the Nestorian Christians of the Malabar Coast, and also of the Jews of the same locality, traditions being mentioned and discussed of the respective origins of the black and white Jews.

The Bishop's visitation included the missions in the territories of Mysore and Hyderabad, and extended as far north as Agra, taking the cities of Indore, Bhopal, and Gwalior *en route*, about all of which territories and cities there are many historical allusions, with pleasing descriptions of the country and of the buildings. The rock-cut temples of the island of Elephanta, and those in the neighbourhood of Nasik, were visited, and are minutely and intelligently described. A few well-chosen woodcuts have been added by the publisher, which are valuable as supplementing the written descriptions, and more of them would have been welcome.

Russia. Note e Ricordi di Viaggio. Di Giuseppe Modrich. Torino-Roma : L. Roux e C., 1892. Pp. 550. *Price* 5 *L.*

Though Russia lies at no great distance from our own shores, our knowledge of the country, government, and people is by no means complete, and the accounts given by travellers and authors are in many respects conflicting. A well-digested and impartial work, written with the sole object of imparting accurate information, would, therefore, be a great acquisition. Such, however, is not the character of the present volume. From the first the author displays strong Russian proclivities and an equally strong prejudice against, or even detestation of, the whole Jewish race. He writes not as an impartial critic, but as a panegyrist of the Russian Administration : he repeats the conversation of Russian statesmen, defends, without entering into details, the policy of the Orthodox Church, and eulogises indiscriminately

every Russian institution. He was warmly received by the highest authorities at St. Petersburg, and appears to have been accompanied by a Russian on his tour in the provinces, during which he was entertained at the houses of the governors and other members of the administration. Consequently, the reader is inclined to suspect that Dr. Modrich, as has happened to travellers in other countries, was told what he was wished to repeat and shown what he was wished to describe.

When the author states that religious persecution is unknown in Russia, speaks of the liberty of the subject and of the press as though the same freedom prevailed in Russia as in Western Europe, when he praises the soberness of the peasant and extols the administration of the *Mir*, we are forced to believe that he has been misled, knowing, as we do, that the state of Russia has been represented in a very different light not only by Jewish journalists, as he would have us believe, but by travellers of repute, and, moreover, in reports of diplomatic representatives. Sometimes, also, facts crop up in the book itself that are not consistent with Dr. Modrich's optimistic views.

As a mere narrative of travel the work is interesting enough. After thoroughly enjoying himself in the hospitable and unconstrained society of St. Petersburg, the author made a tour through Novgorod, Vologda, Moscow, Kief, and other towns, during which he travelled more than 600 miles in a *kibitka*. He describes the cathedrals, *lavras*, and museums, and gives a few particulars on commerce and industry.

Historic Towns: York. By James Raine, M.A., D.C.L. London : Longmans, Green, and Co., 1893. Pp. xi + 223. *Price* 3*s.* 6*d.*

Dr. Raine's historical achievements marked him out very distinctly as the fit historian of York ; and this volume displays ample justification of both subject and writer. Eburacum (Eboracum)—Caer Eabhroig (Ebrauc)—Eoferwic—Jorvik —York has participated prominently in many of the fortunes of England during the course of her eventful history, although we are all apt to think of it chiefly in connection with Roman, British, and Early-English times. Dr. Raine shows how, of pure necessity, York ranked as the capital of Roman Britain : it was in the centre of the island ; and (a military reason wholly) the north, which, unlike the south, was never completely subdued, required the active presence of the Roman soldiery, and Eburacum was an excellent military station and capital, for it lay at the base of a "system of aggression and defence," formed by a double wall far north, checking the Caledonii and Meatæ, and strengthened by a long range of entrenched camps, with numerous stations and forts. Owing to the supremacy and greatness of Northumbria, York declined but little in importance on the departure of the Romans; but after 685—the year, rather than 686 (pp. 30-31), of the end of Northumbrian glory in arms—we associate it more with the Church and learning than with military turmoil and strife. Under the Normans it suffered with other parts of the north, rose to somewhat of its ancient dignity and splendour in pomp and pageant under the Plantagenets, suffered (as a city of churches) at the Reformation, was Yorkist in the Wars of the Roses and Royalist in the Civil War.

Dr. Raine's book consists of three divisions : General History (ending, practically, with the Stuarts) ; Church History, together with Education and Charities ; and the Municipality and City. In each much will be found that throws a light on English history by reference to a single centre. In parts the work partakes largely of the character of a chronicle. The most connected portion, and that probably which will be of most popular interest, is the account of York Minster. For these pages alone, the work ought to be in the hands of all who wish either to view

York with its minster in historic imagination or to visit it in person with an intelligible, informing, and entertaining guide. A few trivial errors will be found, as: the assigning of the title Bretwalda to Æthelfrith (p. 28); a loose reference to the Parliament of 1265 (p. 63); a wrong date (p. 73) for the execution of Thomas, Earl of Lancaster. A few instances of loose writing *ad captandum vulgus* occur, but generally the style is restrained, and it is uniformly lucid. A plan illustrates the Norman fortresses at York.

Scotland Before 1700: *From Contemporary Documents.* Edited by P. Hume Brown. Edinburgh: David Douglas, 1893. Pp. xx + 368.

About two years ago Mr. Hume Brown published an interesting volume entitled "Early Travellers in Scotland," being a collection of the accounts of Scotland given by Englishmen and Frenchmen who visited the country between the thirteenth and the eighteenth centuries. Undoubtedly the pictures of the social and domestic condition of Scotland thus presented were of great value to the historian and the antiquary, as well as of great interest to the general reader. There were many points, however, on which the testimonies of the writers, especially of the English writers, were open to question. Some of them wrote with too manifest a desire to depreciate Scotland for their descriptions to be trustworthy. Their language, strong even to coarseness, was suggestive rather of caricature than of faithful portraiture. This suggested to the author the desirability of discovering how far independent evidence was available for the confirmation or the refutation of these "travellers' tales." He has found a large amount of evidence in the writings of Scotsmen covering nearly the whole period from the close of the fourteenth to the close of the seventeenth centuries, and in the contemporary Acts of Parliament of Scotland. This evidence he has brought together in a new volume which forms a necessary sequel to the former one, and which bears the title "Scotland before 1700: from Contemporary Documents." Among those on whom contributions are levied are John of Fordun, Andrew Wyntoun, John Major, Hector Boece, William Dunbar, Bishop Leslie, George Buchanan, Donald Monro, and David Buchanan (Editor of John Knox's *History of the Reformation*). Besides the Acts of the Scots Parliament, which are freely quoted, there are instructive extracts from the Proceedings of the Justice-Aire of Jedburgh (1510), from the Accounts of the Lord High Treasurer (1515-1542), from the Municipal Statutes of the City of Aberdeen (1440-1565), from the Trade Regulations of the Burgh of Edinburgh (1529-1531), and from the Memorandum Book of Archbishop Sharp, relating to the expense of travelling between Edinburgh and St. Andrews (1663). There are also descriptions of a military expedition made by the Regent Moray in 1568, and of a trial for witchcraft in 1576.

Enough has been said to indicate the abundance, the richness, and the variety of the materials which have been brought together in this volume. It would require much more space than our limits allow to enter upon a detailed examination of its contents. It must suffice to say that all the narratives and descriptions are interesting, while some of them are fascinating, and that they fully justify the thesis of the editor that the social condition of the common people in Scotland in early times was much superior to that of the same class in France, though it is admitted that the French nobility and upper classes had attained a degree of refinement and luxury to which the Scottish people of the same ranks were strangers. Nothing but the highest praise can be given to Mr. Hume Brown for the care, the industry, the knowledge, and the intelligence which he has shown in selecting, arranging, and annotating the materials for this most instructive and valuable volume.

Sunny Manitoba: Its Peoples and its Industries. By ALFRED O. LEGGE. With Map and Illustrations. London: T. Fisher Unwin, 1893. Pp. 297.

The province of Manitoba as a field for emigration has been familiar to the public for a number of years, but since the building of the Union Pacific Railway to Winnipeg and on to British Columbia it has obtained a prominence and importance which it did not formerly enjoy. The progress of the province of late years has been unsurpassed. In 1881 there were only 65 miles of railway in operation—now there are 1400. In that year not a bushel of wheat was exported—in 1891 14,000,000 quarters were exported. The population of Winnipeg has increased 300 per cent., and various towns and villages have sprung up within the last ten years. From writers and speech-makers Manitoba has suffered by extravagant eulogy on the one hand and excessive depreciation on the other; and the author has endeavoured by a careful examination of facts and figures, as well as by experience gathered on the spot, to give an impartial account of the resources of this distant Canadian province. The book will interest the general reader, and cannot fail to be a most useful guide to intending emigrants.

Carnet d'un Voyageur. Au Pays des Veddas, Ceylan. Par EMILE DESCHAMPS, Officier d'Académie, etc. etc. Avec 116 figures d'après les croquis et photographies de l'auteur, et une carte. Paris: Société d'Editions Scientifiques, 1892. Pp. iv + 492.

M. Deschamps landed at Colombo in June 1889, and spent about a year in Ceylon. He made several excursions into the interior, and prolonged his stay at points which were favourable to the prosecution of his inquiries. The most important of his tours was that to the part of the island in which are found the Rhodias and Veddas, races whose origin and affinities have given rise to much discussion in recent years, and cannot yet be said to have been determined with any certainty. He travelled with very little equipage carried by a few porters, and with a small tent, which, however, he used only on emergencies, as he preferred to lodge with any native who was willing to give him shelter in his hut. He lived mainly on what food he could procure in the native villages, and adopted generally the mode of life which brought him into intimate relations with the people of the country, and gave him good opportunities of observing and noting their characteristics. It is the life, character, and surroundings of the people that chiefly engaged his attention. The various races, their manners and customs, their dress, food, habitations, and occupations, their religious beliefs, practices, and superstitions, the productions, wild and cultivated, are all clearly and fully described, not in systematic grouping under classified heads, but as they came before the traveller in his progress through the country. He gives the facts as he noted them down at the time, with his impressions of the moment and the ideas and emotions they suggested, but incorporating also all that he subsequently ascertained on the same subject. The antiquities and the ruins of old cities and palatial structures are not overlooked, but the space and attention given to them are insignificant compared with those occupied with the life and ways of the people. In an appendix is given a number of exact observations and measurements of the physical characters of the Rhodias and Veddas, which have a distinct scientific value, and should help in the determination of their ethnological affinity. M. Deschamps is a traveller of the right sort, who knows what is worth noting and describing. Travelling as he did, he must, one can easily see, have had to endure much discomfort; but this is barely alluded to, and amidst many irritating experiences he maintains his cheerfulness unabated. He is always a shrewd, kindly, and good-

humoured observer, watching his fellows with genuine interest, and able to tell what he saw and heard so as to excite the same interest in the reader. It is only for the English Government or the English officials and planters that there is at times a rather sharp tone in his criticism. But it is easy to make allowance for his readiness to accept the statements of anonymous critics of the Government in the local papers, or for the implied reproach of the English for providing themselves when travelling with comforts and luxuries which he, having a special object in view, dispensed with. This does not in the least detract from the general excellence of the volume, which unquestionably gives a truthful, lifelike, and most interesting picture of the island and of those who inhabit it. The illustrations are numerous and judiciously selected. Those which are copied from the author's sketches are excellent, but the process-reproductions of his photographs are unfortunately, in not a few instances, rather lacking in clearness and sharpness of detail. The map is hardly worthy of the volume.

A Collection of Treaties, Engagements, and other Papers of Importance relating to British Affairs in Malabar. Edited with notes by W. Logan, Madras Civil Service. Second Edition. Madras: Printed by the Superintendent, Government Press, 1891. Pp. xxvi + 402 + xlv.

This collection throws much light on the earliest settlements of the English on the Malabar coast, and on the relations between the English Company and the rulers of the country with which they traded. It has an interest and value, therefore, not only for officials serving on the Malabar coast, but for every student of the rise of English Dominion in India. Thus, for one thing, it is rather remarkable to find that the earliest engagements with native powers are all in the Portuguese language. This simple fact, more than anything else, makes the reader realise how firm a hold the Portuguese had got of foreign trade with India, and how thoroughly they had established their influence before any of their European rivals appeared on the scene. It is interesting, also, to watch the gradual expansion in the subject and scope of the engagements. At first the English traders are allowed to purchase a certain quantity of pepper subject to payment of a fixed duty. Then permission is given to establish a fortified post. Then come engagements to afford mutual aid against common enemies, agreements about distribution of conquered territory, and so on, until the trading company having become an Imperial State quite supersedes its old protectors as well as its rivals. This collection is intended to serve as the third volume of the *Historical and Descriptive Memoir of the District of Malabar*, which was also drawn up by Mr. Logan. As editor of these documents Mr. Logan has done his work most thoroughly, brief notes explanatory of the circumstances or of the persons mentioned having been given whenever they were required. There is also appended to the volume an excellent glossary of vernacular and technical terms that occur in the documents.

Four Months in Persia, and a Visit to Transcaspia. By C. E. Biddulph, M.A., etc. London: Kegan Paul, Trench, Trübner and Co., 1892. Pp. 137. *Price* 3*s.* 6*d.*

This volume can hardly be said to be of any geographical interest. It is compiled, as the preface states, from articles contributed by the writer to various Indian papers and other periodicals, and bears throughout many traces of its origin. The only part of Persia visited by the writer was the already familiar route from Enzelli, on the Caspian, *viâ* Teheran to Ispahan and back again. He crossed the Kavir or Salt Desert, it is true, by a track somewhat to the eastward of the usual

road from Teheran to Kashan, but the road he followed can only be guessed at, as no names are given Notwithstanding his very limited personal knowledge of the country, the writer indulges in sweeping general statements on almost every subject connected with it, and assumes an air of naïve superiority, towards both natives and Europeans, that often raises a smile. For instance, after finding fault with all existing maps, especially as regards the Salt Desert region which he traversed, he adds : "It is a great pity that some more systematic measures are not taken for remedying these deficiencies, for such amateur work as can be done with a plane table and prismatic compass, which were the only instruments used by my companion to Ispahan" (an officer of the Indian Intelligence Department), "though very valuable as matters stand, is useless for all practical or scientific purposes. What is wanted is a professional survey officer, with suitable instruments *and a proper staff of chain men, etc.*" The italics are our own. The grotesque idea of *chaining* for a cadastral survey of the Salt Desert and its surroundings is a good illustration of the writer's manner of dealing with other matters, and of the degree of reliance to be placed in his sweeping generalities and hasty judgments.

Letters from Queensland. By *The Times* Special Correspondent. London : Macmillan and Co., 1893. Pp. 110. *Price* 2*s.* 6*d.*

These Letters are reprinted from *The Times* of December 1892 and January and February 1893. They treat of the sugar, mineral, and pastoral industries of Queensland, but a chapter relating to "Financial Queensland" would have proved a valuable addition. As a colony, Queensland is said to be the most frightfully debt-crushed of any of the Australasian group. Its Banking system also seems, in common with that of Australia generally, to be thoroughly unsound. Its Government bank suspended payment on 15th May 1893, and two other Queensland banks followed suit. Yet, only a few months previously, *The Times* Special Correspondent writes pleasantly of the enormous mineral wealth of the colony, which contains even "diamonds and sapphires, emeralds and rubies." *The Times* must send him back to Queensland now, in order to complete his book.

Amerika. Eine allgemeine Landeskunde. In Gemeinschaft mit Dr. E. Deckert und Professor Dr. W. Kükenthal herausgegeben von Prof. Dr. Wilhelm Sievers. Leipzig und Wien, 1893.

We are glad to find that Dr. Sievers is continuing the compilation of his useful compendia. We have received the first part of the above work, dealing with the discoverers of the continent.

Longmans' School History of India. By the Rev. G. U. Pope, D.D., sometime Fellow of the Madras University. London : Longmans, Green, and Co., 1892. Pp. 303. *Price* 2*s.* 6*d.*

Dr. Pope was long a successful schoolmaster in South India, and he published a *Text-Book of Indian History* with geographical notes and sixteen maps. This little manual is avowedly a cram-book for the India University examinations introductory to the larger work. "Everything has been sacrificed to the one object of making it thoroughly useful in this way." There is no pretence of literary skill or style in the somewhat dreary succession of names, dates, lists, and sentence-paragraphs. But the printer has helped to give clearness to the whole, and the compiler himself has secured accuracy so far as we have tested his pages, save where Maiwand appears as "Maiward."

Philips's Geographical Manuals. The Geography of the British Colonies and Dependencies, Physical, Political, Commercial. By William Hughes, F.R.G.S., and J. Francon Williams, F.R.G.S. London: George Philip and Son, 1892. Pp. viii + 232. *Price* 2*s.* 6*d.*

This book contains the portions of the *Advanced Class-Book of Modern Geography*, by the same authors, that relate to the British Colonies and Dependencies. It therefore possesses all the merits of that excellent work. It abounds with information—accurate, complete, well arranged, and conveyed in an interesting and often graphic style. Exception may be taken to the separation of Burma from the other provinces of British India; but the arrangement, while inconvenient, is of course defensible on geographical grounds. The book is furnished with a copious index of places—an aid to reference which the larger work lacks.

Practical Guide to the Geography of the British Isles and General Geography. By R. Burnett. Aberdeen: John Adam, 1893. Pp. 132. *Price* 1*s.* 6*d.*

This little book is intended for the use of candidates preparing for Civil Service and other public examinations. It consists partly of notes, partly of exercises, and partly of specimen examination papers which have been set in various departments of the service. It is thus what is known as a "cram-book," and candidates will no doubt find it useful—the more's the pity, for the sake of Geography, and for their own sakes too.

The Geography of Asia: A Brief Handbook for Students. London: Blackie and Son, Limited, 1893. Pp. 38. *Price* 6*d.*

This is a systematic geography of Asia in less than forty pages—about one-third of the space usually devoted to it in text-books of general Geography. The topography occupies only sixteen pages, three of which are given up to maps, so that the matter is very much condensed. The chief features of the book, and the best, are the chapters on the great events of Asiatic history and of the history of British India, on Russian advances in Asia, on native races, and similar subjects.

The Elements of Physiography. By John I. Prince. Part II.: Advanced Stage. Seventh Edition. London: John Heywood, 1889. Pp. 176. *Price* 1*s.* 6*d.*

This is the seventh edition of a book first published in 1877. It contains a great deal of useful information in a condensed form. A good feature of the book is its description of instruments. It contains the Examination Papers of the Science and Art Department from 1877 to 1887, and also a good index.

To the Other Side. By Thomas Rhodes. With Maps and Illustrations. London: George Philip and Son, 1893. [Edinburgh: Sold by J. and H. Lindsay.] Pp. 106. *Price* 1*s.*

Intended as a guide to the tourist meditating a visit to the Chicago Exhibition, the volume will be found useful and instructive for all travellers making a first trip to the United States and Canada, and to such it may be cordially recommended. To the experienced traveller in America it is not the author's wish to appeal. Written in a lively narrative style, these pages may also prove of interest to many who have no intention of visiting the New Continent. Some of the illustrations are old friends, but are generally useful and helpful.

Carlsbad: A Medico-Practical Guide. By E. Kleen, M.D. Pp. 101. G. P. Putnam's Sons: New York and London, 1893.

This is a useful and handy little book, which will not fail to be of service to any one going to Carlsbad in search of health.

It is a mistake to think that a person can choose a health-resort for himself, but the author gives a list of diseases for the cure of which Carlsbad is celebrated, and another of diseases in the treatment of which the Carlsbad waters are contra-indicated. The rules and regulations with regard to the lodgings and baths are clearly stated.

Where to Go Abroad: A Guide to the Watering-Places and Health-Resorts of Europe, the Mediterranean, etc. Edited by A. R. Hope Moncrieff. London: Adam and Charles Black, 1893. Pp. 466. *Price 3s. 6d.*

In this comprehensive and accurate little volume the Editor guides the traveller to the best watering-places and health-resorts of Europe. It is a companion volume to his *Where Shall We Go?*—the latter being confined to Great Britain and Ireland. Mr. Hope Moncrieff is a humorous as well as instructive writer, and his Guide-books are anything but dry reading. In the one before us he tells us that some of the Jews at Carlsbad "look as if they had need of being washed without as well as within;" that Cannes, Nice, and Monte Carlo have been likened to the world, the flesh, and the devil; that the vendetta-loving natives of Corsica assure timid Englishwomen that "they cuts de throat only to themselves;" and that the only clean thing about Naples is the sky, "and that only because the Neapolitans cannot attain to dirty it." All which is very good, amusing reading for the invalids who more particularly will make use of this book and find it an excellent companion.

A chapter is devoted to "Extra-European Winter Stations," including Atlantic resorts, Algeria, Egypt, and India. There is a good map of Europe by W. and A. K. Johnston.

Liberton in Ancient and Modern Times. By George Good. With Introduction by Rev. W. H. Gray, D.D. Edinburgh: Andrew Elliot, 1893. Pp. xx + 185.

Liberton is coming to the front. It is not very long since we noticed Mr. Tom Speedie's monograph on "Craigmillar," which contained many references to the parish and village; and now we have an exhaustive history of the parish from the pen of Mr. George Good—an enthusiastic Libertonian and a most industrious and competent antiquary—the value of which is enhanced by a delightful gossipy and anecdotical introduction contributed by Dr. W. H. Gray, who has been for many years minister of the parish. Mr. Good's book differs in some important respects from that of Mr. Speedie. These differences are due mainly to the different points of view of the authors, the one being essentially an antiquary, and the other primarily a naturalist. The two works may therefore be regarded as complementary to each other, and together they present as complete an account of the parish as any parish in Scotland could desire. It would be a mistake, however, to assume that Mr. Good is indifferent to the mineral and other physical resources of the parish. He devotes an interesting chapter to the Geology and Natural History of the district in which he describes its physical conformation, and especially its richness in deposits of coal, shale, and sandstone, which have created extensive and lucrative industries. Appended to the chapter there is a catalogue of the fauna, including a complete list of the birds found within the bounds of the parish. The strong point, however, in Mr. Good's book is family history. He describes minutely the

prominent estates in the parish,—Craigmillar, Niddrie, Brunstane, the Drum, Gilmerton, Moredun, Stenhouse, Mortonhall, Straiton, Broomhills, Southhouse, and Muirhouse,—and in connection with each he gives an interesting account of the successive proprietors and their families, which enables him at many points to bring the history of the parish into close contact with the general history of Scotland. The illustrations include a facsimile of the Great Charter of Holyrood, which is very interesting, and views of Liberton Church, Craigmillar Castle, and Liberton Tower. The pictures, though crude, are very effective. Such local histories are very much wanted ; and though they may be deficient in literary style, and faulty in other respects, they have a distinct value, both for the geographer and for the historian.

A Ride from Land's End to John o' Groats. By Evelyn Burnaby, M.A., S.C.L. London : Sampson Low, Marston, and Company (Limited), 1893. Pp. xxiv + 146.

A pleasant record of a not uneventful journey is that before us. The ride was suggested by the famous journey on horseback to Khiva, successfully accomplished by the author's late brother ; and, although the travels cannot stand comparison in interest, yet the incidents met with in the later and less ambitious effort were well worth putting on record. The great variety of anecdote, both old and new, which Mr. Burnaby freely deals out as he goes along, makes his pages very entertaining reading. The little volume has also some value as a guidebook, and the hints regarding hotels should prove useful to strangers visiting any of the places described. We observe one or two unimportant slips, not difficult to excuse when the conditions of the tour are remembered ; but the information conveyed is, in general, accurate and well put. Altogether, the narrative will amply repay perusal, and will very agreeably occupy a spare hour or two. The book contains an itinerary and a complete and accurate index.

Kamerun und Sudan. Von H. Jäger. Berlin : F. R. Beuge, 1893. Pp. 162.

The object of the author of this brochure, who states that he is impelled to write owing to the pressure brought to bear by Britain and France upon the German possessions in Cameroons, is to urge the foundation of a "Kamerun Hinterland Gesellschaft." He also wishes to repel what he considers the unjustifiable claims of France and Britain in the Sudan, and to stimulate the German people to what he conceives to be their duty. The first part of the brochure deals with the position of Cameroons and the progress of the colony up to the present time ; the second, with its prospects in the future. We have only space to state in broad outlines the author's argument. He believes that it is the duty of the German people to extend their colonial possessions, and to seek to make them profitable, and he is of opinion that Cameroons is a district in which they will be successful. He holds that the climate is not so bad as it has been represented, and that at a certain distance from the coast the country is salubrious. He also believes that the agricultural prospects of the colony are extremely favourable. During the past year the exports had a value of £220,000, and the imports of £210,000, and during the past four years the customs and taxes have risen from £8750 to over £20,000, so that the cost of government is balanced by the revenue.

The author thinks that the advantages gained will be rendered of little future value unless an immediate effort is made to secure the "Hinterland," and thus to prevent France and Britain from enclosing the colony and effectually preventing its extension. His proposal is to found a company of private individuals which would extend German influence in all directions, and subsequently leave it to the

German Foreign Office to establish a *modus vivendi* between this proposed new sphere of influence and the rival States.

With regard to the labour question, the author believes that if one pushed on far enough inland it would not be difficult to train the natives who have not been deteriorated by a life on the coast to do the necessary work.

He concludes by appealing to the German people to remember the poet's words, "Das Glück, das du von der Minute ausgeschlagen, bringt keine Evigkeit zurück." Whether the German nation will rise to our author's fly is a point upon which it is unnecessary to speculate.

Un Voyage au Yunnan. Par le Dr. Louis Pichon (of Shanghai). Paris: Plon, Nourrit et Cie., 1893.

This is a lively and instructive account of a journey made in the early summer of 1892 from Tonkin to Yunnan, by way of the river Rouge. From Hanoi to Manhao, the first place of importance on the Chinese side of the boundary between Tonkin and Yunnan, exactly four weeks were spent in covering 460 kilometres. A two days' journey overland brought Dr. Pichon to Mongtze, from which he made a visit to the mines of Ko-tchiou. The return journey down-stream was made in eight days. Outside the vivacious account of events and sights by the way, which occupies about half the book, there are very interesting chapters upon the epidemic pestilence (*yang-tzu*), the navigability of the river Rouge, the growingly important commercial aspects of Yunnan, its imports and exports, and the development of Tonkin. The author's free criticism of his country's bad administration of Tonkin is supplemented by very distinct advice as to what France should do in the near future. One of the necessities is the construction of a railway from Yenbai to Laokai (176 kilometres), which mark the limits of a part of the Rouge abounding in cascades and rapids.

Louis Agassiz: His Life and Work. By Charles Frederick Holder, LL.D., Author of *The Life of Charles Darwin*, *Living Lights*, etc. (Leaders in Science Series.) 12mo, pp. xviii + 327. 28 Illustrations. New York and London: G. P. Putnam's Sons, 1892. *Price* $1.50.

The laudable aim of the series, in which this life of Louis Agassiz is the second volume, is to give a brief account of the life and work of "Leaders in Science." The first volume was a life of Charles Darwin by the same author, and one can hardly refrain from comparing the two men. Both were naturalists in the widest sense, both lived in unselfish devotion to science, both were marvels of industry and thoroughness, both held strong convictions as to the history of organic nature, and both were leaders in science, though in different ways. Darwin by his books was the chief agent in persuading scientific men as to the truth of the general conception of organic evolution: Agassiz by his power as a teacher and worker had a profound influence on the progress of science both in America and in Europe. Darwin was an evolved Lamarck, Agassiz an ennobled Cuvier. That both were wise we all know.

Dr. Holder is an accomplished writer of interesting books; he has adequate knowledge and no lack of sympathy; and if his skill in biography does not attain to a high degree of art, that is only what must be said of most. It is to be noticed that this volume does not in any way compete with the larger *Life*: it has another aim—that of telling the story in short compass, and of placing before general readers the chief results of an heroic industry and of a noble influence. We think that Dr. Holder has realised his aim with great success. Our chief criticism is

that he allows his enthusiasm to run away with him. A certain measure of extravagance is pardonable in the memorial speeches delivered soon after the death of a great man (though we think the book would not have lost much had the chapter which contains these been omitted), but it is now nearly twenty years since Agassiz died—time enough, surely, for an enthusiastic biographer to have become calm. "Possessed of a divine genius" is a mere phrase which may pass, but "the greatest teacher of his time" is a title which one should be careful with, while the statement that "Agassiz was the great theistic philosopher of the age in which he lived" is an uncritical absurdity.

The value of the book is increased by a scholarly bibliography. Pretty binding, pleasant type, and some delightful illustrations, *e.g.* "Agassiz at nineteen," will contribute to the success which the author's work deserves.

Argentine, Patagonian, and Chilian Sketches, with a Few Notes about Uruguay. By C. E. Akers. London: Harrison and Sons. N. D. Pp. vi + 190.

The practice of reprinting the letters of special correspondents, sent to all parts of the world by the enterprising proprietors of many of our chief journals, is one, we think, to be commended; for these communications frequently contain matter deserving of better preservation than is afforded by the pages of a daily newspaper. The small volume before us is a good example of the class of work referred to, including, as it does, the cream of the information collected by Mr. Akers during the two years in which he represented *The Standard* in South America. His matter and manner are alike very readable, the subjects selected for description have been judiciously chosen, and are such as are certain to prove of interest to all who wish to obtain something more than a mere superficial knowledge of the economics, customs, resources, and potentialities of a very interesting region about which too little is known—as British investors and emigrants have found out to their cost within recent years.

The Australians: A Social Sketch. By Francis Adams. London: T. Fisher Unwin, 1893. Pp. 314.

So far as we are aware, this is not only the most interesting but the most important and best work which has yet come from Mr. Adams' pen, and it must do much to advance his reputation in the literary world, not only as a writer but as an original thinker. Although we cannot bring ourselves to agree with all his conclusions, we unhesitatingly admit the great value of his volume, and earnestly recommend its contents to all interested in the question of Imperial Federation. Mr. Adams does not view this movement in any very enthusiastic spirit—and gives some weighty reasons for his belief—but urges that if any steps are to be taken towards federation no time is to be lost. It is not a matter that admits of delay. The author, however, goes too far, in our opinion, when he states that "the only possible union between Australia and England, which shall contain the elements of solidity and growth, is one based on the principle of 'Alliance not Dependence.'"

The author's style has been considerably chastened, and it is possible to read all that he has to say with a sense of pleasure unmarred by constant eccentricities in both phrase and punctuation. We observe, also, that he has so far conformed to popular usage as no longer to spell "Australian" with a small initial letter. It would, perhaps, be too much to expect Mr. Adams to write without some peculiarity, and we note that in the work before us he has made almost every sentence, however short it may be, into a separate paragraph.

The publisher has produced a beautiful book, pleasant alike to the hand and eye. There is no index.

Letters from South Africa. By *The Times* Special Correspondent. London: Macmillan and Co., 1893. Pp. 116.

At the request of several of the most prominent public men in South Africa, these Letters are reprinted as they appeared in *The Times* of July—October 1892. They contain a valuable summary of the latest achievements of the Anglo-Saxon race in bringing to the surface the latent wealth of South Africa. Kimberley with its diamond mines forms the first description, and we have explained to us in an interesting way how the De Beers Company has dealt with the difficult Labour question of the country, for the Company's mines employ three kinds of labour—convicts, free natives, and white men. Then the Correspondent proceeded to Johannesburg, which, he says, "stands upon gold." He considers that British mining and agricultural machine-makers, by not adapting their patterns to African necessities, are losing ground every day. A few years ago, English firms possessed the entire machinery trade of South Africa; now one American firm supplies at least 40 per cent. of the mining machinery in use at Johannesburg. Arriving at Pretoria, he found English to be the common language. The pastoral Transvaal only is Dutch; the industrial Transvaal is practically an English State presided over by a Dutch government. The Boers view the English miners with jealousy. "England is filling that country which they had vaguely thought of as theirs." Our Correspondent thinks that the two races should endeavour to live amicably together—the Dutch on their farms, and the British developing the industries of the country. Letters from Bloemfontein, Maseru (Basutoland), King William's Town, and Pietermaritzburg (Natal) complete a well-written and attractive volume.

Tropical America. By Isaac N. Ford. London: Edward Stanford, 1893. Pp. 409. *Price* 10*s.* 6*d.*

This interesting and well-illustrated work is written by Mr. Ford of Havana, and was printed in Boston, U.S.A. The author sailed from New York to Rio de Janeiro in November 1889, and spent nine months in Tropical America. He went down the coast from Rio with "a merry company of English travellers, who were bound for Patagonia, the Falkland Islands, and Chili." Most of them were sheep-farmers, and they told him that the capital required for opening Patagonia on both the Argentine and Chilian coasts was supplied from England. "The bleak Falkland Islands are tenanted by Scotchmen, who have opened large sheep-farms there. This is the southernmost European colony in the New World; and whilst it has a population of only 5000, the English are there to make what they can out of it."

What particularly struck Mr. Ford was the manner in which South America has come commercially under the influence of Europe. "While the United States has been neglecting its shipping interests and doing nothing to restore its commercial marine on the high seas, Europe has been building and manning merchant fleets by which an empire could be conquered." In every port of South America the flags of Britain, France, Germany, Italy, Spain, Belgium, and Brazil are to be seen, but the flag of the United States is nowhere visible. People in Montevideo "vaguely regard the United States as being a curious country, having a place somewhere on the map of the Western hemisphere."

At the same time, the influence of Europe on commercial South America has not been an unmixed blessing. Mr. Ford considers that English investors have ruined the Argentine, which is rather hard upon the investors, who consider that

the Argentine has ruined them. "Tempted by high rates of interest, English investors," he says, supplied the Argentines, the Yankees of the Southern hemisphere, "with financial resources for every premature undertaking and reckless enterprise. The Argentines were speedily intoxicated with their own success. They ceased to do anything for themselves." When the crash came, and "their speculative bubbles were pricked, they turned and upbraided the English investors for teaching them to be extravagant, and for foolishly lending money to them without examining the securities."

A map by R. D. Servoss, New York, but no index, accompanies this excellent work.

Shearer's Illustrated Guide to Stirling, Stirling Castle, Bannockburn, Wallace's Monument, and Neighbourhood. Stirling: R. S. Shearer and Son, 1893. Pp. 108.

The interest of the great historical events which formerly took place in the neighbourhood of Stirling, as well as the romantic beauty of the surrounding scenery, and the varied nature of its antiquarian remains and modern monuments, all combine to make this district a favourite tourist resort. Any one contemplating a visit to the area described in the *Guide* need wish for no better pocket companion than the work now under review. It is a neat, well-equipped little volume, comprehensive in treatment, generally trustworthy, and fairly well illustrated with really serviceable plates, cuts, and maps. Every one, however, will not agree with the compiler when he describes Wallace's Tower as a "noble" erection; and the fact that considerable doubt has been thrown on the legend of the "Virgin Martyrs"—a legend depending on such very doubtful authorities as Woodrow and Macaulay—ought to have been mentioned where the monument in memory of the supposed "martyrs" is described.

The enterprising publishers have produced an excellent volume, which has our hearty commendation.

Northumberland: its History, its Features, and its People, by the Rev. James Christie, B.A. London. Carlisle: Charles Thurnam and Sons; Newcastle: Mawson, Swan, and Morgan; London: Presbyterian Publication Committee, 1893. Pp. 152.

The title of this little book is too ambitious for its contents and its size; for the work is not a dissertation, or rather a history in the proper sense of the term, but a popular lecture on certain prominent features, incidents, and characters connected with Northumberland. The principal charm of the book is derivable from the author's warm love of his native county; its worst faults are discursiveness—for which, perhaps, sufficient excuse may be found in the form in which it was originally cast—and, what is not so pardonable, an abusive use of stereotyped phrases, several of them not in the best of taste. An example or two will show what we mean. 'We need only mention the names of . . . all famous breeders and flock-masters—to prove that the Northumberland *flocks* are little likely to *take a back seat anywhere*' (p. 50)—'of all this and of much more is the Quay Side of Newcastle made up. *May its shadow never grow less!*' (p. 80.) Some warmth of phrase is allowable to the local patriot, but such diction as that just quoted admits of no excuse. Nor is the book free from inaccuracies in fact: Margaret, whom James iv. of Scotland married, was not the daughter of Henry viii. of England (p 44); Upsala is a long way distant from the north of Sweden (p. 63). The book is well printed and bound, and adorned with four good full-page illustrations.

NEW MAPS.

EUROPE.

BRITISH ISLES.—Johnston's Maps of the Lake Districts of England, Scotland, and Ireland. *Price* 1*s. each.* *W. & A. K. Johnston, Edinburgh,*

It is a pity that these maps should have been constructed on different scales, presumably for the sake of uniformity in size. Consequently, as a special map, that of the Scottish Lake District is rather small. It contains, however, a large amount of detail for its dimensions, and will meet all the requirements of the ordinary tourist. The English map might be better executed.

IRELAND. *W. & A. K. Johnston, Edinburgh and London.*

A wall-map, with a handbook giving a general description of the island, with a detailed description of each of the four provinces and the principal cities and towns. We are inclined to think that the statement "No part of the interior is more than fifty miles distant from the sea" can hardly be strictly accurate.

SOUTH AMERICA.

ECUADOR, Carta Geográfica del ——. Por Dr. Teodoro Wolf, publicada por orden del Supremo Gobierno de la República y trabajada bajo las Presidencias de los EE. Señores Dr. D. J. M. Placido Caamaño y Dr. D. Antonio Flóres. Escala 1:445,000. *Leipzig: Instituto geografico de H. Wagner & E. Debes. Presented by the Author.*

Dr. Wolf has now, with the assistance of the Government of Ecuador, published the results of more than twenty years' explorations in the form of an excellent map of the Republic, accompanied by a handsome volume of letterpress. Beginning with the construction of geological plans of the most important localities, the author gradually extended his labours until he had surveyed all the more accessible parts of the country. Some of his investigations have already been given to the public in his *Viajes cientificos por la República del Ecuador* (1879), and in his *Mapa de las Provincias del Guayas y de los Rios* (1882). To his own material he has added from the works of his predecessors whatever, after a critical examination, seemed worthy of credit. The map embraces the lower regions of Western Ecuador between the Pacific and the Andes, from the Rio Jumbez to the Rio Mira. Of the Amazons region, lying beyond the Eastern Cordillera, little is known, the only available data being a few old missionary maps and itineraries of travellers who have during the two last centuries navigated some of the rivers. Dr. Wolf has, therefore, drawn this vast country on a reduced scale, as an inset map. The boundaries of the Republic, which have never been strictly delineated, have been laid down according to the author's interpretation of the existing treaties with the neighbouring republics. The Galapagos Islands are drawn from the British Admiralty Charts. For heights, besides his own observations, Dr. Wolf has made use of a list compiled by Reiss and Stübel. It is singular that Whymper's carefully executed observations are ignored, and that no reason is given for rejecting the results. The map has been admirably executed by Wagner and Debes of Leipzig. Dr. Wolf must be congratulated on the successful termination of his long and ardent labours. His map will be a very useful companion for ordinary travellers as well as for scientists who may visit the country for the purposes of exploration and research.

APPROXIMATE SKETCH MAP OF

MEAN ANNUAL SUNSHINE OF THE BRITISH ISLES

(FIVE AND TEN YEARS' AVERAGES)

BY H. N. DICKSON AND J. G. BARTHOLOMEW.

The Curves show number of Hours of Sunshine out of 4400 Hours "Possible Sunshine" in the Year.
The Colouring is graded from the lightest tint showing Regions with most sunshine to darkest tint with least.

Stations where observations have been taken marked thus •

THE SCOTTISH

GEOGRAPHICAL

MAGAZINE.

THE SIAMESE FRONTIER.

By Coutts Trotter, F.R.G.S.

(*With a Map.*)

The recent sudden attack upon Siam by the French,—unexpected probably by most of our readers—followed by the immediate surrender by Siam of a considerable portion of her territory, may render acceptable a few notes on the regions more immediately concerned.

In speaking of the territories occupied by France or under her protectorate, we are apt to think of Tongking, Annam, and Cochin-China, which together on the modern map form the eastern and south-eastern border of the great Indo-Chinese peninsula, as to some extent separate countries. Practically, however, it is more correct to consider them as one, inhabited by one dominant race, the Annamese, which is akin to the Chinese, and which, having been for very many centuries under the influence of China, and for some time directly under her control, retains a close resemblance to the Chinese in manners, customs, and institutions. When first known to history they were located in Tongking only, under the name Giao-chi, a term having the signification of *divergence*, which is said to be explained by the phenomenon that the grass on the Chinese side of the frontier bends its heads to the north, and that on the Tongking side to the south.[1] It would be well if all Indo-Chinese frontiers were as distinctly defined. From Tongking the race gradually spread southwards along the strip of country between the mountains and the sea familiarly known now as Annam or Cochin-China. Here they came in contact with a people famous in mediæval times, the Champa, who seem to be akin to the Malays, and also—as we are probably justified in believing—derive part of their blood from the Indian immigrants to

[1] Colquhoun interprets the name to mean "bifurcated toes," the big toes of the Annamese being widely separated from the others—a peculiarity still found among the hill tribes.

whom the vanished greatness of Cambodia is attributed. The Champa were gradually driven southward, and are now found only in scattered communities, but they still retained their place on the maps of last century. The Annamese then, still pressing further south, conquered and annexed those deltaic provinces of the kingdom of Cambodia, embracing the mouths of the Mekong, which were afterwards annexed by the French, and now form their colony of Cochin-China, or, more correctly, Lower Cochin-China (La Basse Cochinchine).[1] The kingdom of Cambodia has been in decadence for centuries, and dependent alternately on Annam and on Siam; in the present century it fell finally under the influence of the Siamese, who in 1810 annexed the provinces of Tonlé Repau and Mulu Prey, and soon after Battambong (Angkor being already in their power), and would have reduced the whole kingdom to dependence but for the "protection" accorded it by the French, who, however, by the treaty of 1867, left Battambong and Angkor definitely in the possession of Siam.

The race now inhabiting Cambodia is composed of various elements grafted on the original population. The authors of the vast and magnificent buildings at Angkor and elsewhere can hardly have been other than Indians, but their numbers were probably small. There is a large Shan element. The typical Cambodian is said to be bigger than his neighbours, and to have altogether a less Mongoloid appearance.

It may be worth while here to recall the relationship in which these different states or provinces constituting *l'Empire Indo-Chinois* stand to the French and to each other. Thus Tongking is not a French colony in the ordinary sense, but an integral part of the kingdom of Annam, which in 1884 accepted a French protectorate; the foreign and general policy of the kingdom being controlled by the French, while the different departments of the State, with one or two exceptions, as Public Works, Customs, etc., continue to be administered by natives, though French official residents are quartered in all the provincial towns. Cambodia is in like manner a protected kingdom, under perhaps more direct French control than Annam. Cochin-China is a colony, with a separate governor and full administrative apparatus on the French model, and has pursued on occasions a very independent line of its own, even to the extent of annexing provinces from the two protected kingdoms, and denouncing the follies of the administration of the protectorates in its official journal.

With the exception of these territories under French influence, the rest of the Indo-Chinese peninsula, up to the mountain ranges which enclose Annam, is mainly occupied by the Thai or Shan race, of which the Siamese, though not the oldest, is now the most considerable branch, and politically stands in marked contrast to the others in the capacity it has shown for comprehending and maintaining the imperial idea. There have been, and are, Shan States of considerable extent and

[1] The name Cochin-China has been thought to be a corruption of Ko-cheng-ching, *i.e.* "the ancient Cheng-ching" (the Chinese name of Champa), but it may have been merely given by Europeans from the similarity of the position on the peninsula to that of Cochin on the Indian coast.

power, as Chieng Mai and others in the north, and Vien Chang and Luang Prabang to the east, and the three mentioned enjoyed a prosperous independence during intermittent periods of some length; but as a rule they have never maintained their independence long, and the lesser ones have generally been satisfied with more or less precarious federation.

The mountain range, or, to be more exact, the broad belt of mountainous country, which separates Annam from the more plain country to the westward, is inhabited by various independent and so-called savage tribes, having considerable natural capacity, but at a low stage of culture. Their presence, and the nature of the country they inhabit, sufficiently explain the small degree of influence which Annam, even in her most prosperous days, has exerted over the country to the westward, since no such influence could be permanently exercised without first reducing to order the intervening mountaineers, with their very difficult country, averaging in breadth some 50 to 180 miles. And this has in fact never been done. The country between these mountains and the Mekong is occupied by the Laos, members of the Thai or Shan race, who acknowledge the supremacy of their congener, the King of Siam, though the actual marks of allegiance shown are slight. Still these have for the last seventy years or so been growing more definite. In the great State of Luang Prabang, for instance, whose territory extends both east and north from the Mekong, there is a resident Siamese Commissioner, whose authority now overshadows that of the local ruler.[1] And, in a smaller way, officials representing the central Siamese power are found throughout the various Laos districts east of the Mekong, their authority being often extended over the hill-tribes in their neighbourhood. Mr. Archer states that one is established at Muong Ahin in the valley of the Nam U, in about 22° N. latitude. A great part of the country east of the Mekong is, however, very imperfectly known. In some parts the mountain and jungle region inhabited by the independent tribes is very extensive, reaching nearly to the river. These tribes offer many features of interest. As a French writer puts it, they are hardly "sauvages," but rather "barbares." They have little or no power of combination, living in little groups of villages, each autonomous; but they weave, and work in iron, and cultivate the soil—wastefully indeed, burning down the forest to make a clearing. They are desperately superstitious, many of their customs and beliefs, *e.g.* the great common dwelling-house, the dread of spirits, sacrifices, and ordeals, recalling similar practices in the Pacific and elsewhere. These last, however, seem throughout the peninsula more or less to underlie the later Buddhism. They punish evil-doers either by fines, or in grave cases by selling them as slaves, so their criminal classes instead of their being a burthen are a profit to them. These tribes are probably capable of indefinite improvement, but except on the outer fringe of their domain are still very little known. Some of the wide gaps in our knowledge have been filled by French explorers, chiefly officials, and very capable and accomplished observers. These

[1] A French Consul also resides there, under an exequator from the King of Siam—a direct admission of his sovereignty.

gentlemen are very naturally desirous to find evidence of any rights or claims on the part of Annam over this country; indeed, this seems sometimes to have been the chief object of their researches, but the evidences discovered amount to very little. Certainly since the reduction late in the last century, by the Siamese, of the state of Vien Chang, with which the Annamese had temporary relations, there seems to have been but little active movement on the part of Annam beyond the mountain barrier. Vien Chang rebelled and was finally destroyed by Siam in 1828, and about that time some parts of the region known as Tran Ninh were in dispute between Annam and Siam, but were finally yielded to the latter power. Some subsequent efforts of Annam to extend her influence in the direction of Luang Prabang were extinguished by the inroads of the Haws from the Chinese frontier. All this is in accordance with the evidence of the best maps, including those published in France up to a recent period, as for instance in Reclus' *Géographie Universelle*, and in that attached to Francis Garnier's great work, which was produced in 1886. With some comparatively slight differences as to the northern frontier of Cambodia, they all draw the western frontier of Annam along the crests of the watershed. And it may be added that all the French authorities most conversant with the question,[1] when writing from the sublunary standpoint of political geography, admit frankly, if reluctantly, the validity of the claims of Siam on both sides of the Mekong. The claims then of France, gravely urged now as of right, to the Mekong as frontier (with a reservation in favour of the mountain ranges still further west) must be held as founded on some higher, antecedent, indefeasible right, lying deep in the eternal fitness of things,—a point of view which we as geographers do not feel competent to discuss.

Some topographical information, interesting perhaps rather as showing what might be than what was, is given as to a former trade route leading from the upper waters of the Se-bang-hieng, an eastern affluent of the Mekong, across a low pass in the mountains to another river which debouches near Hué, the land portion of the route being only about 30 miles long. The actual road, however, is no longer in existence, and the extent to which it was ever used is very doubtful.

The endeavours of the French authorities to divert towards Saigon the trade which now goes to Bangkok and Chantabun, will no doubt be renewed under more advantageous conditions now that their influence in the Mekong valley is to be so largely increased. According to a fair and candid *résumé* by M. Gallois[2] of the narratives of the French travellers above alluded to, confident hopes are entertained that the traffic of at least the eastern half of the peninsula may be attracted by the three parallel outlets afforded by the French territories, viz.—1. That in the north, from Yunnan, by the Song Koi or Red River to Hanoi and Haiphong; 2. In the centre, by the new route recently examined leading

[1] We need only mention the name of M. de Lanessan, the present Governor-General of French Indo-China.

[2] *Annales de Géographie*, Juillet, 1893.

from the middle Mekong up the Se-bang-hieng river, and across the mountains to Hué and Tourane; and 3. In the south, from the lower Mekong and Cambodia towards Saigon.

This question of the probable future course of the trade of these countries is of special interest to us, seeing that of the trade of Siam, which was valued in 1890 at exports £3,209,000, and imports £2,631,000, at least three-fourths is with British territories, while nine-tenths of the carrying trade is in British hands. As is well known, the French authorities, endeavouring to persuade the trade of the eastern and central Siamese provinces to take the line of the Mekong, have seen with much dissatisfaction the increasing importance of the central Siamese emporium at Khorat, and the commencement of a railway thither from Bangkok. If, following on recent changes, any direct or indirect interference with the course of trade takes place, our commercial interests might be seriously compromised, and we should have reasonable grounds to protest. The result of the proposed opening of the middle route across the mountains to Tourane would be of considerable interest. If the route is as free from serious obstacles as it is said to be, the chief immediate economical objection which occurs to us is the extreme paucity of population in the districts which would be tapped by it; and it should be always borne in mind that obstacles to navigation in the Mekong must always prevent that river, so far as we can see, from becoming a highway for traffic.[1]

To return to the question of the Mekong as a frontier. It is a matter of common observation that a river is one of the worst possible frontiers, especially as between two powers of very unequal strength. A stipulation has been added by the French in this case that Siam shall maintain no armed force within 16 miles of the frontier line. Under all the circumstances of the case the results, if not the intention, of such a stipulation must be patent to everybody. As regards the Mekong, again, it may be observed that the population of both banks is homogeneous, and that it does not anywhere form the boundary between great states; while its remarkable windings and angles make it exceptionally unfit for this purpose. Of the mutilations which the drawing of this frontier would arbitrarily inflict, for instance, on the State of Luang Prabang, we do not propose to speak. But higher up the river our own territorial rights, as well as our interests, will be found to clash with this very unscientific frontier. This was clearly pointed out last year by Lord Lamington in an important paper read before our Society.[2] The great Shan State of Kiang Hung, formerly tributary both to Burmah and China, and also the territories of Kiang Kheng, the suzerainty of which was another part of our Burmese inheritance, lie partly on the left bank of the river. As regards the former, it is understood now to be under the control of

[1] Impediments to navigation already commence at Kratieh, and continue thence up to Stung Treng. Thence to the Khong rapids it is pretty free, and from above these rapids to the mouth of the Semún river (about 90 miles). Above this it is interrupted again until above Kemmarat, whence there is a long navigable reach (some 230 miles) up to Nongkhai. Above this point it can hardly be said to be navigable at all. No doubt something has, and much more might, be done to supplement these deficiencies by canalisation.

[2] *Magazine*, vol. viii. p. 135.

China, while Kiang Kheng was lately ceded by us to Siam on condition of its not being surrendered to "any other" Power. The eastern limits of Kiang Kheng probably coincide with the line of hills which form the divide between the Mekong and its tributary the Nam U, but Kiang Hung, the metropolitan state of the confederacy known as the Sipsong Panna, has relations even further eastward. Probably, however, we should be satisfied to accept this hill region as our frontier of influence. It would have this great advantage that it is crossed by not more than one or two available passes. We venture to think that this would be quite as desirable and permanent a frontier as any "buffer" state; but if the latter arrangement is preferred it would seem equitable that the buffer be found, or created, to the eastward of this mountain barrier.

It should be remembered also, that the cessation of our influence in the above-mentioned territory on the left bank would seriously jeopardise the trade now passing through it towards Burmah, and would almost necessarily mean the abandonment of any such scheme as that so long and perseveringly advocated by Mr. Holt Hallett of a railway connecting Moulmein, by way of the Siamese Shan States, with the Chinese province of Yunnan, the object of which is to establish direct trade relations between a British port and the trade of South-Western China. Now it would be quixotic not to expect that this scheme would be opposed to the uttermost by any influence which the French authorities could bring to bear, seeing that it stands in direct rivalry to their own scheme for attracting the very same trade by the route already referred to down the Song Koi or Red River to the Tongking ports. This scheme, though its feasibility, as regards the facilities of the Red River for navigation, has been questioned by some experts, is considered by its promoters to be of the highest importance; but they have also an alternative scheme, viz., having annexed Luang Prabang, to bring one or more lines from the north down to that very important point, and to establish there an emporium of trade; and obviously such as scheme as Mr. Holt Hallett's would be as antagonistic to this as to the Red River route.

It will no doubt be readily understood that there are various points of interest connected with this question of frontiers, and with the Siamese question generally, which, as bearing on current politics, the writer is precluded from discussing in these pages.

THE NEW MAP OF PERSIA.

By Jas. Burgess, C.I.E., LL.D., F.R.G.S., etc.

Last year the Royal Geographical Society published a new Map of Persia, prepared, under the superintendence of the Hon. George Curzon, M.P., by W. J. Turner. It was every way desirable and appropriate that the great English Geographical Society should undertake the preparation of a new map of such a country as Persia: indeed, its subsidy from Government could not be better employed than in works of a like character.

In the *Memorandum* prefixed Mr. Curzon has described the various materials on which the new map is based. No triangulation of Persia, of course, exists; but "the presence of the Indo-European Telegraphic Staff," he says, "has availed to determine the longitude and latitude of important centres; while over the bulk of the country surveys have been conducted with such instruments as independent travellers happened to possess; chiefly with plane-tables, sometimes with the aid of prismatic compasses, traverses, or astronomical observations; the nature of the instruments employed not being stated in every case." The result is that Persian surveys constitute a sort of medley or patchwork, and "the utmost that can so far be claimed even for the best Persian map, is approximate fidelity to the truth."

The value of any map constructed from such materials must thus primarily depend on the accuracy of the geographical co-ordinates accepted as its basis; and for further advances and corrections, as well as a means of estimating its true value, it is of the utmost importance we should have a full list of these data, either separately or engrossed and indicated in the index.

As it is, however, we are left entirely ignorant as to the positions that have been assumed as fixed, and with relation to which the others have been laid down. In a map intended to supersede those hitherto in use, this is specially unfortunate. A position B, for example, may afterwards be found to be in some error in relation to A or C or to both; but unless it is known which has been authoritatively determined we may shift B from its true position, when it is really A or C, or both, that are in error. In this map there have been many displacements made of the positions on the older maps. We take as examples the following from Keith Johnston's *Index Geographicus* (1864) and add the displacements on the new map:—

Places.	Keith Johnston.		Displacement on New Map.	
	N. Lat.	E. Long.	Lat.	Long.
Basrah,	30° 31′	47° 53′	− 3′	− 1′
Ormiyah (Urumiah),	37 15	45 9	+18	− 3
Hamadan,	34 50	48 25	− 4	+ 7
Zanján (Zinjan),	36 21	48 32	+12	− 3
Abah (Avah),	35 27	49 18	+ 9	−14
Káshán,	33 50	51 47	+ 8	−22
Isfahán,	32 41	51 52	0	−13
Naubandajan (Naubanjan),[1]	30 8	51 53	−22	−50
Firuzabad or Gaur,	28 43	52 47	+ 3	−18
Kazarún,[1]	29 35	51 47	0	− 5
Yazd,	32 5	54 46	− 7	−30
Jurján,	37 15	55 12	+11	+23
Tun,	33 52	57 27	+ 9	+39
Bamm,	29 13	58 14	−23	+ 4
Tuz,	36 27	59 36	− 6	−13

[1] From the relative position of Kazarún it seems doubtful if this is really meant for نوبندجان, the Naubinjan of Keith Johnston's map; if not, what has become of the latter?

It is important to know how these changes of positions, varying from 3′ to 50′, have been arrived at; but the data have not been submitted to us. The consequence of this is necessarily that the utility of this map as a basis for further rectifications is seriously interfered with. We do not know what places have been laid down on satisfactory observations and what are only placed in approximate positions with respect to such as have been more accurately determined. Possibly it is not too late to remedy this serious want, and the authors may yet submit a list of all the co-ordinates they have accepted and engrossed in their map, with their values. The coasts, we may assume, are laid down chiefly from Admiralty surveys, but the inland points properly determined by astronomical observation are of equal importance for all future rectification.

The question of orthography has of late years been specially taken up by the Royal Geographical Society, and we might expect that, in a map produced under its auspices and at its expense, some serious attempt would be made at uniformity. Mr. Curzon says: "Broadly speaking, I have observed the rules laid down by the Society, *i.e.* I have retained the conventional spelling of such names (even if strictly incorrect) as have been fixed by long custom, *e.g.* Bushire *vice* Abu Shehr, Meshed *vice* Mashhad, etc.; while vowels should ordinarily be pronounced as in Italian, and consonants as in English. Subject to these two conditions, I have tried to represent the native sounds with as much accuracy as the very imperfect symbols of the English alphabet will admit of, preferring on the whole to incur the charge of looseness to that of pedantry." To "represent the native sounds with *as much accuracy as* the English alphabet *will admit of*" is hardly compatible with looseness; and accuracy is not pedantry. There are difficulties in the way of representing Persian names in Roman characters; for if we are to avoid diacritical marks, we have only one symbol, *z*, to represent the four letters *zál*, *ze*, *zád*, and *zá*; and *s* has to do duty for *se*, *sín*, and *súd*, while *t* has to stand for both the soft and hard sounds of that letter, and phonetic representation has long been confused by the Stambuli use of *e* to represent the short or inherent vowel in Yezd, Tebriz, etc., for which *a* is so much nearer the Tehráni sound. But we can hardly understand Mr. Curzon's complaint that "it is difficult indeed to secure uniformity in a country or countries where there are constant slight differences of pronunciation or inflexions of tone, according to the language or dialect locally in vogue." This might be an excuse for variant spellings if Persian were not a written language and had no recognised standard of pronunciation among cultured natives. Do we for such reasons spell the same name differently when it occurs in York and in Wilts, or even in Canada? And when we find *Safíd* (white) applied to two or more hills or rivers in Persia, why should we spell one *Safed* and another *Sefid* —neither being nearer the representation of the Persian sound than *Safid*. In the north-west of Persia we find a tendency among the natives to a Turkish accent and the pronunciation of the short inherent *a* as *e*, while in India the tendency would be to the sound of *u*, and sometimes of *i* or *í* as *é*; but no educated Tehráni would call the capital *Teh-e-rán*: the name is a dissyllable; a Turk might say *Lenkorán*, or *Resht*, a Persian would say

Lankurán and *Rasht*. A Persian again will insist on the very different sound of ق (*qáf*) from ک (*káf*) or the English *k*, and even in vulgar pronunciation they are not confounded, though *ghain* is occasionally substituted for *qáf*, especially in Arabic and Turkish; hence *Qain* (in Khorasán) is sometimes written as *Ghain*, and *Abarqúh* as *Abarghúh*: the map has "Kain" and "Abarguh" instead. In *Mash-hed*, the tomb of Ali ben Musa al Reza, the *h* is a distinctly separate aspirate after the *sh*; "Meshed" does not represent the sound: and the name being applied to the *tombs* of various saints, we have five of them on this map, including a second Mashhed-i-Reza, 30 miles N.E. of Khwâf.

Surely the same name ought to be spelt always in the same way; yet a glance at the index shows such incongruities as the following:—

Kalandarabad and Kalenderabad; Fateh-abad, Fathah-abad, and Fathabad; Dorak and Dorek; Karimabad and Kerimabad; Kabutaran and Kebutar-Khan; Jamali and Jemalabad; Iskandarabad and Iskander-Kul; Mubarakabad and Mubarek; Rustamabad and Rustemabad; Sarai and Serai; Sarbaz and Serbaz; Zainabad and Zeinabad; Jabal-dagh and Jebel; Haidari and Haiderabad.

Jeshah and Jishah; Istir and Ister; Nemek and Nimik; Mianeh and Son-meani; Malik and Malek; Gishan and Gishun.

Firoz and Firuzabad; Gazik and Gazak; Islam and Islim; Jafarbair and Jafirabad; Kameh and Kama; Kokah and Koka.

Furk, and Furuk, Farukhi and Farukabad; Ghar, Ghur, and Gudh-ghur, Khwajagarh and Panjgur; Kuh-i-Shutur, Kuh-Shutari and Shutargardan; Sangal and Sangul; Juwanabad and Juwun; Kadam and Kudum; Kahan and Kuhun; Band and Bund.

Derbend and Derbent; Mokhula and Mokula; Surk and Śurkh; Menjil and Menzil; Shemsabad, Shemshabad and Shemzabad; Panjgur, Punjdeh and Penjakent; Sadat and Saadetabad; Sayad, Seyid, Saiadbut and Saidabad.

Garmarud and Garm-Rud; Arghawan and Arghwan; Shat-el-Adhem, Adam-ulan and Deh Adam-Khan; Abdarahman and Abdul-Rahman, etc. etc.

Besides, we have names like Hookee, Weiss, Ndorak, Muhabbat, Kadj, etc., which can hardly be spelt according to any rule. The Ῥαγί of Arrian is reproduced as *Rhe*; but in modern Persian the *r* is not aspirated here, and *Rai* or *Rey* would better represent the sound.

If the common English form 'Bussorah' is to be corrected at all, it ought to be into *Basra* or *Basrah* and not *Busrah*, which introduces a new and false form if we are to use the Italian sound of *u* consistently.

The above list, which might readily be increased, indicates how little any rule in spelling has been attended to.

It would help the compiler to have such a list as the following before him for the uniform spelling of elements that enter into so many names on this map:—

Ab—water;	*-âbâd*—town, etc.;	*band*—dyke;	*daryá*—lake, river;
dasht—plain, desert;	*dih*—village;	*-gard, shahr*—town;	*kisn*—fort;
jazirah—island;	*jebel*—mountain;	*kara*—black;	*khân*—caravansarai;

khor—river mouth ; *kizil*—red ; *kûh*—hill ; *nahr*—water, etc. ;
namak—salt ; *nau, no*—new ; *pal*—bridge ; *rás*—headland ;
ribát—caravansarai ; *rúd*—stream ; *safid*—white ; *siyáh*—black ;
-stán—country ; *takht*—throne ; *zard*—yellow, pale.

In the selection of names of places, the author allows that he has "exercised a somewhat arbitrary choice," and has "given preference to the recorded experiences of the most recent travellers." There is reason for this, but, on the other hand, old sites mentioned again and again in old travellers and native geographers are usually something more than "a caravansarai or a well," and in any revision of this map—which we trust will be undertaken—it would be worth while inserting such of these as retain a moderate population. We miss the district name of Tabaristân, so often mentioned in Persian history, the town of Sâlamâs, etc.

The scale adopted is 60 miles (English), or about $51\frac{2}{3}$ geographical miles to the inch, which, we learn, "is uniform with that already applied to the Royal Geographical Society's large map of Tibet still in course of execution." For Tibet such a scale may be large enough, but for Persia, which, in parts at least, is much more densely crowded with names, a scale of 48 E. miles to the inch would have allowed of greater clearness. And by omitting Afghanistan, etc., the map could have been got into a sheet 23 inches by 25 even on this larger scale.

There are about 4900 names on this map, which is divided into areas of 2° each way, or 2 inches by $2\frac{1}{3}$, each representing about 16,500 square miles, and within the area of Persia and Afghanistan each of these contains from fifty to seventy names finely engraved. The index only indicates the "square" in which a name is to be found, and we have to search among these large numbers for the particular one wanted. It is a cheap and easy sort of index, but not very satisfactory for the investigator. When used at all, "squares" on finely engraved maps ought to be so small as not to contain more than twenty or thirty names. But no scientific work ought to be without a full index of latitudes and longitudes—those which may be accepted as scientifically ascertained being distinguished from the rest. We have a model index, combining both the system of squares and that of geographical co-ordinates, in Keith Johnston's *Index Geographicus*, which contains 130,000 place-names, with district and province, as well as position of each; and we think new maps of this nature, intended to lead the way to still better, ought to have equally scientific indices.

The map otherwise is in every way so good, that it might be expected of the Royal Geographical Society to issue a better edition of the index with the designation and districts of the place-names, their corrected spellings and geographical positions, distinguishing such as are *primary* to the construction from those that are relative, and thus make it available as a basis for a still more accurate delineation.

It would be curious to trace the influence of the Arab geographers, or of Ptolemy, in the composition of modern maps, such as that of Persia.

In 1652 Professor John Graves of Oxford published two tables of geographical positions, one by Khwajah Nasir-ad-dîn at-Tusi (A.D.

1200-1273), and the other by the Prince Ulagh Beg (*cir.* A.D. 1437). These tables agree both in the list of places and in their latitudes and longitudes—the latter being reckoned from Ferro, as with Ptolemy. But Ptolemy's longitudes are well known to have been too great by about 20 per cent.; and to make them comparable with modern longitudes

Place.	N. Latitude.		Longitude E. from Greenwich.	
	The Persian Authors.	On New Map.	Persian Authors −34° 50′	New Map.
Abah or Avah,	34° 40′	35° 36′	50° 20′	49° 4′
Abhar,	36 45	36 6	49 40	49 16
Ahwáz,	31 0	31 19	50 10	48 44
Ámúl,	36 35	36 26	52 30	52 18
Astarábád,	36 50	36 52	54 45	54 23
Ardabil,	38 0	38 15	47 40	48 19
Bamm,	28 30	28 50	59 10	58 18
Basrah,	30 0	30 28	49 10	47 52
Bastám,	36 10	36 31	54 40	55 1
Dámaghán,	36 20	36 13	55 5	54 25
Firuzábád,	28 10	28 46	52 40	52 29
Hamadán,	35 10	34 46	48 10	48 32
Hormuz,	25 0	27 3	57 10	56 26
Isfahán,	32 25	32 41	51 50	51 39
Istakhr (Persepolis),	30 0	29 47	53 40	52 50
Jurján,	36 50	37 26	55 10	55 35
Káshán,	34 0	33 58	51 10	51 25
Kazarún,	29 15	29 35	52 10	51 42
Khabis,	31 0	30 28	58 10	57 39
Khoi,	37 40	38 33	44 50	45 0
Marághah,	37 20	37 23	47 10	46 13
Marand,	37 50	38 27	45 55	45 48
Nakhjowan,	38 40	39 11	46 25	45 22
Naishábúr (Nishápúr),	36 21	36 14	57 40	58 49
Naubandaján,	30 10	29 46	52 25	51 3
Qáin,	33 40	33 44	59 40	58 30
Qazwin,	37 0	36 14	50 10	49 59
Qomm,	34 45	34 39	50 50	50 56
Rai,	35 35	35 35	51 30	51 30
Rámahormuz,	31 0	31 8	50 55	49 44
Sabzwár,	36 0	36 14	56 10	57 42
Sálamás,	37 40	(38 13)	44 15	(44 38)[1]
Sáwah,	36 0	34 58	50 10	50 10
Semnán,	36 0	35 34	53 10	53 25
Shiráz,	29 36	29 36	53 10	52 33
Sultániyah,	36 29	36 25	49 15	48 47
Tabriz,	38 0	38 4	47 10	46 20
Tun,	34 30	34 1	57 40	58 6
Tuz,	37 0	36 21	57 40	59 23
Urmiyah,	37 0	37 33	44 55	45 6
Yazd,	32 0	31 58	54 10	54 16
Zanján,	36 30	36 33	48 50	48 29

[1] Wanting in the new map; the positions given here are from Keith Johnston's *Index Geographicus*.

reckoned from Greenwich, we find that in general, if we reduce Ptolemy's values by 1-5th and then deduct 17° 43′ for Ferro, we get the position very approximately. For most places in Persia this would not differ much from subtracting at once 34° 50′;[1] and as this can readily be done, and will afford a very fair ground of comparison between the positions, as accepted six hundred years ago or more, with those of the new map, I have compiled the above table of some of the principal towns found in *both*—adopting the spellings of the Oriental writers.

The agreement in position of the old approximate positions with those still retained is often very close; and a further comparison of Nasir-ad-dîn's with Ptolemy's might be interesting.

THE ARID LANDS OF THE UNITED STATES.

A VERY large portion of the territory of the United States, which may be said to extend westwards from about the 100th meridian of W. long., is almost useless for agricultural purposes owing to the small rainfall. The soil is far from being poor; indeed, in these arid regions it is remarkably deep, showing hardly any perceptible change down to a depth of several feet, and it has been found that soil brought from great depths is nearly as productive as that on the surface. It also contains such a quantity of calcareous matter that, properly irrigated, it should be even more productive than the land of the more humid regions of the States.[2] Nor do these regions resemble in outward appearance the deserts of the Old World, being for the most part covered with vegetation—grass, shrubs, and sometimes trees, or in the drier localities cactuses, agaves, and other plants which require little moisture. The rainfall, however, being under 3 inches at Yuma, and seldom exceeding 16 inches except on the mountain slopes, is insufficient to raise agricultural crops, especially in a country where the temperature is high enough to cause considerable evaporation. Naturally the question of rendering such extensive lands capable of cultivation has long been under the consideration of the Department of the Interior, and the effect of the measures it may adopt cannot but be of general interest. It has been often disputed whether trees increase rainfall. Herr Müttrich in Prussia, and Mr. Blanford in India,[3] have noticed a decided increase in the quan-

[1] This is the exact amount at about long. 51 E. from Greenwich, or 86′ from Ferro; for great accuracy we should subtract 12′ from the values in the third column for every degree that they exceed 51°, and *vice versâ*; but as they are only stated to the nearest 15′ or 20′, and are not very accordant, this would only result in bringing some of them nearer to the true position, whilst others would be further removed. Besides, several of the positions in the fifth column may still be only approximate.

[2] *Report on the Relations of Soil to Climate*, by E. W. Hilgard. Weather Bureau, *Bull.* No. 3.

[3] *Ciel et Terre*, April 1st, 1893.

tity of rain on lands where forests have been planted, but Major Powell came to the conclusion that in America trees have no such influence, and the same result has been obtained from observations in Algeria; the explanation probably being that in these countries there is no moisture in the air to bring down. Consequently the only means of increasing the productivity of these lands is to irrigate them with water brought down from the mountains, and especially that produced by the melting of the snow in spring. It is, then, most important, before undertaking works which will be very costly and of a permanent character, to obtain full and accurate information regarding the supply of water available, the area over which it can conveniently be distributed, the quantity per acre required to raise crops successfully, and the means of storage offered by the configuration of the surface. These particulars, as far as they have been at present ascertained, have been collected into a bulky volume, entitled *Hydrography of the Arid Regions*, by Mr. F. H. Newell, of the U.S. Geological Survey. To show the importance of the question, it may be stated that in the Gila Basin, out of 66,020 square miles, crops were raised in the year ending June 30th, 1890, only on 96·65, and in many other basins the proportion of productive land is very small. On many thousands of acres to which water is already supplied the crops are lost or injured from a deficiency at critical times, and this is partly due to waste, the canal owners holding out no inducement to economy. Farmers are, however, learning that better results may be obtained by small amounts of water intelligently applied than with greater, and it is found that on many soils the amount required gradually diminishes, the permanent humidity of the ground being raised, or points of escape being clogged. The area that can be irrigated by a given quantity of water is known as "the duty of water." The unit of measurement in general use is the second-foot—that is, a quantity equal to a stream of a square foot cross-section flowing at the rate of one foot per second. The acre-foot is another unit, *i.e.* the quantity of water that will cover an acre to the depth of one foot. What the actual duty of water is has never been accurately ascertained. Major Powell, in his *Reports on the Arid Regions of the United States*, 1879, gave the average for Utah at 100 acres to the second-foot, but in actual practice it proved to be only 70 acres. In Wyoming and Idaho, where little care was taken, the duty was only 30 to 40 acres. In Arizona and California calculations have been made showing that with economy a second-foot may be made to serve for 120 acres, or even more.

As already mentioned, snow is of great importance for the purposes of irrigation, for in most of the rivers in the arid regions the most useful floods are due to the melting of snow rather than to rain. The want of coincidence between the monthly rainfall and the discharge of rivers is shown in Mr. Newell's work on a diagram. Here it is seen that the maximum amount of rainfall at Denver, Colorado, is recorded in May, while the discharge of the Cache la Poudre above Fort Collins does not attain its maximum until June; the discharge of the Rio Grande at Embudo is greatest in May, the maximum rainfall occurring early in August; while the Colorado at Yuma and the San Joaquin rise to their

greatest heights at the beginning of June, the maximum rainfall occurring in August and January respectively. In general the maximum rainfall in the arid regions occurs on the east in summer, while on the west the driest period is in May and June, followed by heavy rains in July and August, at the time of the greatest droughts in California.

It is of the greatest importance for irrigation purposes to ascertain whether the quantity of water carried down by the rivers during the floods is largely in excess of the amount discharged at other seasons. Along most of the rivers of the west the area of cultivable land is greater than can be irrigated from the rivers at the low level at which they are flowing when irrigation is required, and in most cases all the water obtainable under the present circumstances has already been appropriated. In order, then, to bring more land under cultivation it will be necessary, after introducing economy into the present distribution, to store up the flood waters for use in time of need. The question, therefore, arises whether the excess of water during floods is sufficient to repay the cost of constructing and maintaining storage works. The floods in rivers which receive their main supply of water from melted snow differ conspicuously in character from those which depend chiefly or partly on rain. In the former they rise gradually to a maximum, and then decline almost as continuously, whereas in the latter they are exceedingly irregular, coming at any stage of the river and passing off suddenly. By dividing the maximum discharge by the average quantity of water flowing in the river, Mr. Newell shows that in most of the rivers the flood water has four to five times the volume of the average flow for the year. The Rio Grande at El Paso, the Gila, and the Salt are the most notable exceptions, the floods in the former two amounting to eleven and twelve times the average flow, and in the last to as much as a hundred times. These three instances are illustrations of the enormous fluctuations to which the rain-fed rivers of the south are subject.

Another important point is the time at which floods occur, and the relation between the duration of high water and the growth of crops. As a rule, the floods in the rivers of the west take place in the spring, but much depends on the altitude of the catchment basin. There is usually an ample supply of water at the time that crops are planted, but towards the end of the season the rivers fall and the crops are partially destroyed by drought. Thus, it may be said that the later the floods occur the better for the success of the crops and for storage schemes, for the shorter will be the time that the water must be stored, and hence the less will be the loss from evaporation. Consequently the rivers which are best adapted for supplying storage reservoirs are such as those of the Upper Missouri and Arkansas basins, which derive their supply from lofty mountains, whereas the Gila, Salt, Malheur, and Owhyhee, for example, are much less reliable, being fed by rain, and very uncertain in their changes of level. The rain in these dry tracts, falling on hard earth or barren rocks, flows off immediately and is not retained by the soil as in the better clothed humid lands.

The rivers of the country under discussion rise in great mountains and flow as torrents through narrow valleys and cañons, finally entering

level plains of vast area. The sources generally lie in a cold and inhospitable region, where large quantities of snow accumulate during the winter, and frosts occurring in almost every month of the year render agriculture impossible. Below this region lie valleys which, though still at a considerable elevation, are suitable for grazing, and can support a few of the hardier crops. Here grows the most valuable timber, and the climate is not too severe for habitation. It is here, also, that the sites most suited for storage reservoirs are found. Farther down, beyond the cañons, stretch wide, open valleys, succeeded by rich alluvial plains. At those lower altitudes, with a warm sunny climate, valuable crops can be raised with a proper supply of water. Here, near the foot of the mountains, the rivers flow in well-defined channels, but on the plains below deposits of silt check the velocity of the stream, which spreads itself out over a large surface, branching out into numerous channels with a depth at ordinary level of not more than a foot, and losing a large proportion of water by seepage and evaporation. Therefore the point where the water can be drawn for irrigation to the best advantage is where the river begins to change its character, for here it is carrying the maximum amount of water.

Major Powell has divided hydrographic basins into three classes, viz.: headwater districts, river trunk districts, and lost stream districts. The first include the sources of the river on the mountains, their torrential courses, and the land adjoining the river where it leaves the mountains. This is the most important part of the basin from the standpoint of irrigation. The river trunk embraces the large area through which the main stream flows, where it receives little addition to its volume, but, on the contrary, loses much of its water by seepage and evaporation. Its condition is, therefore, dependent on the headwater district, and it cannot be treated satisfactorily until the problems connected with the headwaters have been settled. In the third class of basins, one of the most important in the west, and perhaps, the most easily controlled, the circulation of the water is complete within the basin itself. The rain falling on the mountains flows in torrents to the plains, where it is restored to the air by evaporation. Each of these basins may be considered independently, whereas in those river systems which reach the sea the storage of water on any one tributary must be considered in connection with the whole system, as it tends at one time to diminish the flow of water in the river into which it runs and at another time to increase it. All the above classes are represented in many of the great river systems, for instance, in the Arkansas, Rio Grande, and Gila.

In water conservation it is of great importance to prevent loss by evaporation, both in the flowing water and on the fields, by sheltering the soil. From a table of evaporation observations at Fort Douglas near Salt Lake City, near El Paso, and at Tempe, Arizona, it appears that the monthly evaporation from large pans is from two to three inches in winter, rising in July and August to 7 or 10, and in some cases to as much as 13 or 14. In the Gila basin the evaporation is roughly reckoned at about 91 inches in the year, and the discharge of the river probably does not exceed 5 per cent. of the rainfall. The Missouri

to take another example, shows a much higher percentage; at Dauphin Rapids, about 12 miles above the Judith river, gaugings in 1879 and 1880 showed a run-off of 30 and 37 per cent., respectively, of the rainfall of these years, or depths of 4·67 and 6·30 inches.

Mr. Newell has collected all the records of the gaugings of the different rivers, and exhibited the results by diagrams, and also in tables, where the discharge is given in second-feet, the monthly totals in acre-feet and the run-off in inches—a work which must have entailed a large amount of labour and care—and describes each basin in detail. Some of these are of special interest, as the Rio Grande, which is of large extent, and contains soils and climates of widely different character. The total area of this basin, which is contained in the States of Texas and Colorado and the Territory of New Mexico, down to the junction of the Pecos, is 145,200 square miles approximately. But not all of this area contributes water to the river, for it includes many tracts from which there is no outflow. The perennial supply of water comes from about 2000 square miles of lofty mountains in the Rio Grande, Conejos, and Costilla counties. In the upper part of its course the river flows through narrow valleys and the Rio Grande and White Rock cañons, receiving various tributaries, the last being the Puerco, which enters about 60 miles below Albuquerque; below this there is no tributary of importance until the Pecos is reached, 400 miles below El Paso. The Mesilla valley, the most fertile in New Mexico, begins below Fort Selden, and extends a distance of 50 miles to the pass above El Paso. Except this, there are no large valleys in New Mexico along the main stream or its smaller tributaries. The water, especially in the central and southern parts of the State, is heavily loaded with silt, which is deposited to a certain extent in the valleys, forming broad alluvial plains. The channel of the river is generally choked with sandbars, and at low water is divided into numerous small channels where a large percentage of water is lost in the large deposits of fine matter. The rainfall is irregular and the records are imperfect, but it may be said that at most stations in the northern part of the basin it seldom falls below 10 inches or rises above 20. The most noticeable feature is the excessive fall in July and August, and the small amount in the early and late months of the year. On the upper Rio Grande is the San Luis Park or valley, a vast extent of unbroken land, nearly 70 miles long by 40 miles wide. Though lying at an elevation of 7500 to 7700 feet, it possesses a climate not too severe for agriculture, but the water supply is insufficient for the demands of the cultivators, and consequently much litigation has arisen respecting water-rights. The duty of water in this valley varies considerably with the nature of the soil. The farmers taking water from the Del Norte and Citizens' canals buy or rent it on the basis of from $\frac{1}{2}$ to 1 inch per acre, and the latter figure gives the low duty of only 35 or 40 acres per cubic foot. A few, however, who have been more careful in the use of water, and have considered the subject thoroughly, maintain that 1 inch is amply sufficient for 2 acres. The duty certainly increases year by year, and it is affirmed that in the fifth year a crop can easily be raised without any irrigation except that from the seepage from the ditches.

Another of the great agricultural areas is the Taos, and the figures given show what great scope there is for the regulation of the water-supply and the irrigation of land. In this district the area which is adapted for irrigation is about 169,100 acres, but of this only 19,060 are under ditch, and, owing to deficiency of water, only 6100 bore crops in 1889. Again in the Chama valley there are 100,000 acres irrigable, of of which 30,000 are under ditch and only 5500 produce crops. In the Mesilla valley the soil is of wonderful depth and fertility, but agriculture has made slow progress on account of the uncertainty of the water-supply owing to the numerous diversions for hundreds of miles up the river. To supply the present demand below Embudo 3100 second-feet are required, and, though seepage will cause some water to be used many times over, there will often be a deficiency. Then the lands to suffer first will be the valleys of Mesilla and Ysleta, where the products are worth many times as much per acre as those of the lands where the water will have been used. Hence the urgent need for reservoirs. The *mesas*, or table-lands, which abound in New Mexico, present peculiar difficulties. There is one on the east of the Albuquerque valley, running from the Sandia Mountains on the north to Socorro on the south, which contains much fertile land; but, lying 300 to 600 feet above the river, it could only be irrigated at enormous expense. South of this is the Jornada del Muerto, the largest *mesa* in the Territory, with a length of 100 miles, and a maximum breadth of 35, which also must be left to its fate. Wells have been sunk and water struck at a depth of 300 feet, but it is often so impregnated with salt as to be worthless. The Cuchillo Negro, and other *mesas* which are skirted by streams having a rapid fall, may, perhaps, be irrigated. The practicability of conducting water on to them can only be decided by a thorough examination of the ground.

A short description is given of the Newton reservoir in Cache valley, as typical of small reservoirs of the arid lands, which was built by the landowners themselves, and has a water-surface of 147 acres, with an average depth of 6 feet, its capacity therefore being from 800 to 900 acre-feet. The water is confined by two dams, one on each side of a hill, which enclose the basin of the Clarkson creek. The main dam is 500 feet long and 30 feet high, and is constructed of earth, the steeper inside slope being formed of a series of steps held up by planks. Into this reservoir are collected the waters of the creek, which has a drainage area of 40 square miles. The original cost of its construction was £1450, to which must be added the expense of rebuilding three dams which have been carried away in succession. By means of this reservoir 1000 acres are cultivated, and wheat is grown on them, two waterings being usually sufficient. At the second watering, in June, the reservoir is entirely drained, and in 1889, an exceptionally dry season, it was barely full when the first watering was commenced. The reservoir might be enlarged at no great expense, but one would think from the above experience that its usefulness would not be increased to a great extent. In many districts, however, better results may be obtained.

The loss from evaporation, and the usefulness of large basins for storage purposes, has been particularly studied in the case of Utah Lake.

This lake is a shallow body of fresh water 22 miles long, with a maximum breadth of 7 miles. It is fed by streams which in the spring are rivers of considerable size, while in the summer and autumn they are almost dry, and therefore its level varies from month to month. Its yearly fluctuations are also very large. Now, as the shores, except on the west side, are very low, and slope gently to the lake, the rise or fall of the surface covers or leaves dry an enormous quantity of land. It may be said that for every rise of 1 foot 1000 acres are submerged, which are restored to use on the fall of the lake; and these lands are all utilised, for the area of arable and pasture lands in Utah County is somewhat limited. On the other hand, the water discharged from the lake by the Jordan river is indispensable for a large portion of the cultivation of the broad and fertile plain of Salt Lake County. The amount of evaporation has a bearing on the adjustment of these conflicting interests. The discharge of the Jordan not having been systematically gauged, the evaporation cannot be deduced from the quantities of water entering and leaving the lake; but, from experiments made at Fort Douglas and Salt Lake City, it is estimated that the evaporation is about 56 inches a year, ranging from 1 inch in January to 8·4 in August. On the basis of the area of the lake at low water, 80,000 acres, the mean annual loss must be at the least 514 second-feet. Now, the mean discharge of the principal feeder, the Provo, was 532 second-feet for the year ending July 1890, and 472 second-feet for the year ending 1891, so that the whole discharge of this river is necessary to counterbalance the loss from evaporation in the lake, and the measurements of the American Fork and the Spanish Fork show that their united discharge amounts to only about 60 per cent. of this loss. Moreover, perhaps not even half of this water enters the lake, being diverted into the fields and there evaporated. Hence it is evident that the lake is too large to give the greatest effect as a storage reservoir. If it were half, or even less, of its present area, a large proportion of the water in years of scarcity would be retained for use in the canals of Salt Lake County. But to preserve the water of high floods, which occur at intervals of five to ten years, the lake must have as large a flood area as it has now, and therefore the land around the lake has been segregated to a contour line about 5 feet above the low-water mark of 1879.

These few extracts from Mr. Newell's elaborate work may suffice to show what a variety of intricate problems are involved in the irrigation of the arid regions. Not only have suitable sites for storage to be chosen, but the available water in the streams and rivers must be ascertained to some degree of approximation, and the variations of the supply in good and bad years. The distribution of the water must be so arranged that, after the higher lands have been irrigated, sufficient may be left for use on fields lower down the stream, waste must be prevented by the regulation of the flow in accordance with the duty of water, which, in turn, varies with the nature of the soil and the crops raised, and the cost of the construction and maintenance of irrigation works must be carefully estimated beforehand, lest the outlay should prove too large to yield a proper return. The Geological Survey has already collected a vast

amount of information, particularly with regard to river discharges, which are set forth in the tables contained in the *Hydrography of the Arid Regions*. It remains, however, to ascertain accurately the quantity of land in each basin on to which this water may be turned, what proportion of it the supply is capable of irrigating properly, and how far this supply may be increased by the storage of the spring flood-water.

And, besides all these engineering problems, there will be great difficulties to overcome in the settlement of established rights. Farmers have already settled in the mountainous regions, where they can grow nothing but hay, occupying lands which might be more profitably employed as collecting grounds, and diverting the water from the fertile valleys below. Then, again, where irrigation is practised, the canals have often a greater total capacity than there is water to fill, or, perhaps, than is needed for the lands they serve, while sometimes a supply which has long been used by the agriculturists of a valley is tapped higher up stream and diverted to other lands. To adjudicate on these often conflicting claims, and to enforce the most economical use of the water, that the maximum effect may be obtained, will be no slight task, and many years will probably elapse before a thorough and satisfactory system of irrigation is in working order. And then, probably, as in all artificially irrigated lands, the accumulation of salts, which has already proved troublesome in California, will have to be dealt with. Underdrainage is a successful remedy, but it is expensive, and with this method a quantity of water would be expended simply in washing the surface soil. Gypsum also is very useful, transforming carbonate of soda into Glauber's salt, and much may be done by deep tillage and planting crops, which will shade the soil, and prevent evaporation.[1] These remedies, however, entail extra expense, which will diminish the profits on crops raised in the arid regions.

THE ANDES OF WESTERN COLOMBIA.

Dr. Hettner, whose sketch of the mountains of Peru was noticed three years ago in this *Magazine*, has contributed to *Petermanns Mitt.*, Bd. 39, No. 6, a description of the Andes of Colombia, which really constitute the northern extremity of the mountain chain skirting the Pacific shore of South America, for in the Isthmus of Panama the hills are of small elevation, and the mountains of Central America run in a different direction, while the mountains of Santa Marta, though probably resembling the Andes in their composition, are separated from them by a broad depression, and the Cordillera of Bogota, together with the Cordillera of Mérida, must rather be considered as an independent elevation diverging to the west than as a link in the system of the Andes. The Andes of Western Colombia are a direct continuation of those of Ecuador and Northern Peru, though

[1] *A Report on the Relations of Soil to Climate*. By E. W. Hilgard. Weather Bureau. *Bull.* No. 3.

volcanic action plays here a less important part, and the mountains are of lower elevation towards the north, as well as of a different character. The Western Cordillera of Ecuador is continued in the Western Cordillera of Colombia, and the Eastern Cordillera in the Colombian Central Cordillera, the name Eastern Cordillera being applied in the latter country to the range of Bogota. Between the Western and Central Cordillera lies a long depression, which, however, is not divided as in Ecuador into a number of small elevated basins, but is occupied by the large longitudinal valleys of the Rio Patia and the Rio Cauca. To the north of 4° 50′ the Central Cordillera loses the character of a well-defined range, becomes lower, and merges with the Western Cordillera into the highlands of Antioquia, which, at about 8°, slope down to the northern lowlands. The western flank of the Western Cordillera descends in the southern part directly to the sea, but from 4° northwards a coast range, the Cordillera of Choco, intervenes, separated from the loftier range by the longitudinal valleys of the Rio San Juan and Rio Atrato. The eastern slope of the Central Cordillera borders in the south of Colombia, as in Ecuador, the basin of the Amazons river, but farther north skirts the valley of the Magdalena, facing the Cordillera of Bogota.

Whilst the Andes of Ecuador have attracted the attention of numerous European scientists, from Alexander von Humboldt to Dr. T. Wolf, those of Colombia have been only hastily and superficially investigated. The only connected description of their orography is that of Codazzi, which, with all its merits, is yet very defective, while a thorough geological investigation has never been undertaken, the only information on this subject being a few scattered notes by various writers. Dr. Hettner, too, has visited only a small part of Western Colombia, and, therefore, is unable to give more than a general sketch of its configuration.

Though the coast cordillera lies so near the sea, its exploration, owing to its dense forests and unhealthy climate, is attended with much difficulty, so that little is known about it. It commences in the south at the bay of Buenaventura (4° N. lat.), and extends through three degrees of latitude to the low hollow of Truando which separates it from the elevations of the isthmus. On its eastern side the Rio San Juan flows southward, and the Rio Atrato northwards, from a watershed only 360 feet above the sea-level. In its central portion, between 5° and 6° N. lat., the cordillera is divided into two ranges by the valley of the Rio Baudo. The height of the cordillera is on an average 2600 to 3200 feet, rising to 5900 at the sources of the Baudo; the peninsula of Corrientes is said to be occupied by mountains 3000 to 3200 feet high, sloping steeply to the sea. According to Karsten, the Cordillera of Choco is composed of loose sand, gravel, marly shales, and detritus containing shells and corals similar to those still living in the adjacent sea. Probably they belong to the older Quaternary formations so widely distributed along the coasts of Peru and Ecuador. But as on the coast ranges of Ecuador tilted strata of Tertiary age are also found, it may be expected that such occur in Colombia also. Little, indeed, is known of the geology of this range, and it can only be inferred that the rocks are of a different character from those of the Western Cordillera, and probably of later origin, for, while

gold abounds in all the streams flowing from the latter, none has yet been discovered in the waters of the coast range.

Of the Western Cordillera, also, the knowledge hitherto acquired is very incomplete. Its western slope is covered with continuous forest, traversed only by two bridle-paths and a few foot-tracks; a view of the country can seldom be obtained, and the deep soil is a great obstacle to geological investigation. Most travellers have only passed along the Cauca valley at the foot of the mountains, and no geologist has ever penetrated into them. It is one of the most rectilinear and compact mountain chains known, for from the Bay of Guayaquil to the Gulf of Darien, across eleven degrees of latitude, or 750 miles, it preserves unswervingly a north-north-easterly direction, turning only very slightly to the north at its northern extremity. In Ecuador it is surmounted by a series of mighty volcanoes, and on its entrance into Colombia it bears the volcanic summits of Chiles (15,680 feet), Cumbal (15,710 feet), and Azufral (15,650), but farther north no volcanoes exist, as far as is known, either on the ridge or flanks of the mountains, and the upheaval of the mountains seems to have been accomplished by the ordinary forces. About 40 miles north-east of Azufral the Rio Patia passes through the range by a valley lying only 1600 feet above the sea-level, but the sharply-defined range, almost up to the Gulf of Darien, never sinks again below an altitude of 6000 feet, and forms the watershed, first between the Atlantic and Pacific, and then between the basins of the Atrato and Magdalena rivers. The sharpest peaks are the Cerro Munchique and others, about 10,000 feet high, near Popayan; the Farallones of Cali attaining a height of 9200 feet; the Cerros Tatama and Caramanta, to the west of Ansermaviejo, over 10,000 feet; the Farallones of Citara, 10,800: in the Paramo Frontino they rise to a height of 11,150, and in the Paramillo (6° 50′ N. lat.) to 11,000. The lowest points, on the other hand, are the summit of the pass between Cali and Buenaventura, 6780 feet; between Asermanuevo and Novita, 8090; and the gap to the north of the Farallones of Citara, 6890. Therefore, for the chain between the Patia valley and the Cerro Paramillo, we find a maximum height of 11,150 feet and a minimum of 6780, whence we get a difference of altitude amounting to 4370 feet. From the Paramillo a chain, known in the history of discovery as the Sierra de Abibe, runs at a gradually diminishing elevation farther to the north, and finally terminates on the east coast of the Gulf of Darien, while another less distinct is said to extend itself in a north-easterly direction between the Rio Sinu and the Rio Cauca.

On the west, the cordilleras of the southern part of Colombia send out, it appears, great branches, which gradually sink and lose themselves in the plains of the coast; and the rivers, as far as is known, follow a nearly straight course from the range to the sea. But farther north, especially beyond the sixth parallel, the streams change their direction from east and west to north and south, and, at some distance from the main range, considerable elevations, ranging up to 11,000 feet in height, run parallel to it. Accordingly, the Western Cordillera in its northern part seems to consist of several chains, which, indeed, may exist in the south, but do not influence the course of the streams to the same extent, and have,

therefore, escaped observation. The eastern slope descends rather steeply to the longitudinal valleys of the Rio Patia and Rio Cauca.

In Ecuador this cordillera is composed, according to Wolf, of porphyry, porphyrite, diorite, and melaphyre, with associated conglomerates and breccia, as well as of alternating strata of Cretaceous sandstone and slate, besides the overlying volcanic deposits of recent origin. Such also is its composition throughout its course through Colombia, as far as can be gathered from the statements of Codazzi, Cornette, Karsten, André, and others. In the porphyritic rocks and, to some extent, in the adjacent slates, are found veins of ore which are now worked, especially near Frontino; on the western slope, at a elevation of 130 to 3000 feet above sea-level, are large deposits of auriferous detritus, while some coal is associated with sandstone and red clay.

The Western and Eastern Cordilleras are separated along the greater part of Ecuador, and up to 4° 50′ in Colombia, by a large longitudinal depression, which has been fitly called the Inter-Andine Hollow, and which may be compared to the long cleft formed by the valleys of the Rhone, the Upper Reuss at Andermatt, and the Upper Rhine, which parts the Bernese from the Middle Alps. In Ecuador, and in the southern extremity of Colombia, this hollow is occupied by a number of separate basins, between which saddles run from the one cordillera to the other. Most of them form independent drainage basins, which pour their waters, sometimes to the Amazons river on the east, sometimes to the Pacific on the west. The most northern of these isolated basins is that of Ibarra, from which the Rio Mira flows out westwards. Across the desolate mountains of the province Los Pastos we then come to the plateau of Tuquerres, from which the water flows neither to the east nor west, but northwards to the lowlands of the Rio Patia, where, mingling with that river, it starts on its course through the Western Cordillera. The valley of the Rio Patia differs from the basins of Ecuador in having a more extended form and a lower elevation. Being only 1720 feet above the sea at its lower extremity, and rising to 2020 feet at the village of Patia, 47 miles farther up, it is very hot, and is notorious for the unhealthiness of its climate. The river has cut through a plain composed of deep deposits of detritus, sand, and clay, which Codazzi regards as an old lake-bed, while Karsten assigns to it a marine origin. To the north of the village the valley rises more rapidly, and becomes narrow as it ascends towards the transverse ridge that connects the cordilleras and divides the tributaries of the Patia from those of the Cauca. This saddle, known as the Cuchillo of Tambo, is 5580 feet high, but is considerably lower than the cordilleras, and occupies a similar position in the configuration of the mountains as the Furka or the Oberalp pass. On the northern side commences the great longitudinal valley of the Rio Cauca. Its first section is the beautiful upland valley of Popayan (5710 feet), which stretches almost up to the third parallel, and appears to have the character of a plain furrowed by streams and brooks. It is composed of horizontal strata of recent origin, of which it is at present impossible to say whether they are old lake-bottoms or alluvial terraces. On the third parallel the river breaks through a rocky barrier, and then

traverses as far as 4° 50′ a broad diluvial plain called the valley of the Cauca, which is very fertile. At its lower end it is probably about 500 feet lower than its upper, the heights given for Cartago and Quilichao being 2990 and 3500 feet respectively. A little to the north of Cartago the Cauca enters a narrow rocky ravine, where it diverges from its former longitudinal direction, and, curving eastwards, flows among the mountains of the Central Cordillera, not returning to the foot of the Western Cordillera until 5° 40′ N. lat. is reached. In the interval, the Inter-Andine Hollow is represented by the valleys of the Rio Riseralda and Rio San Juan, which, however, with the exception of the lower extremity of the Riseralda valley, are not broad depressions, but narrow mountain gorges. To the north of Cartago, therefore, there is a fusion of the two cordilleras.

Through the whole of the Inter-Andine Hollow, from the frontier of Ecuador to 4° 50′ N. lat., the rocky structure is visible only at a few points—scarcely anywhere except at the Tambo saddle and the barrier of Quilichao. While in Ecuador the ridges separating the isolated basins are mostly formed of volcanic rocks, in Colombia, where volcanic rocks are generally less common, they are constructed of older rocks advancing from the cordilleras. On the western side of the hollow, they appear in general to be built up of Cretaceous strata and coal-bearing strata of red sandstone and clay, possibly of Tertiary age, like the Guaduas strata of the Cordillera de Bogota, while on the eastern side they are composed of eruptive rocks and auriferous slates.

The Central runs parallel to the Western Cordillera, at a distance of 40 to 50 miles. In the south it is considerably higher than the latter, but from 5½° N. lat. it becomes lower, losing the marked character of a chain of mountains. The greater elevation of its southern part is partly to be ascribed to the volcanic formation, which extends farther to the north than on the Western Cordillera. In the south we find the Pasto volcano (13,990 feet), not, however, rising from the central ridge, but from the western slope ; near Popayan the volcanic axis of the Coconucos, ending at the north-west with the Purace (15,420 feet), traverses the ridge obliquely, and to the south-west rises the somewhat lower Sotara (14,570 feet). At the pass of the Guanaca, about 15 miles to the north of Purace, the ridge has sunk to 11,500 feet, and displays gentle rounded forms, while at the Moros pass, only a little farther north, it has again risen to 12,400 feet, with sharply-cut peaks. A little farther the extinct volcano, Huila, attains a height of 16,700 feet (?). Then follows, for a distance of about 120 miles, a very uniform ridge, never falling below 11,500 feet, or rising above 13,000, except where stands, somewhat apart towards the east, the Barragan, or Ojo de Santa Catalina, which is covered a part of the year with snow, and must therefore be about 14,800 feet. Beyond the Quindio pass, 11,500 feet high, lies another series of volcanic summits, which begins on the east of the watershed with Tolima (18,400 feet), one of the most regularly-shaped conical peaks in the world, is continued by several smaller snow-covered summits, and terminates in the broad, flat Ruiz, second only to Tolima in height. It was probably in the Ruiz, and not in the Tolima, that the

volcanic eruption of March 12th, 1595, reported by Fray Pedro Simon, took place, for the mud which laid waste the whole province of Mariquita was carried down by the streams that have their sources on the Ruiz, the Guali, and the Lagunilla. The Ruiz, with the crater on its western foot (Olleta, according to Reiss), 16,000 feet high, is the most northern manifestation of volcanic energy. It is succeeded by the sharp Paramo de Aguacatal and the Paramo de Herveo, to the north of which the Alto de San Felix brings the altitude of the cordillera once more up to 13,000 feet, while the Alto Paredes, near Sonson, is said to attain to 11,800 feet.

To the south of Cartago the western slope of the cordillera is rather short and simple in formation. Numerous rivers descend from the ridge, most of them flowing directly to the Inter-Andine Hollow. North of Cartago, where the Cauca turns eastwards and leaves the hollow behind, subsidiary ranges make their appearance between this river and the valleys of the Rio Riseralda and Rio San Juan, which here take the place of the hollow.

The eastern slope is much longer (according to Codazzi, 30 miles on an average), and its valleys seem not to run always at right angles to the range, but to have longitudinal sections. It cannot, however, be gathered from maps and descriptions whether parallel chains exist. In the neighbourhood of Chaparral and of Ibagué, that is, at the foot of the Barragan and of the Tolima, are found large caldron-shaped hollows, which may perhaps be due to rupture. The eastern edge, as far north as 4°, is not formed by the valley lands of the Magdalena river, but by the outermost chains of the Eastern Cordillera, or Cordillera de Bogota, for from La Plata on the south stretches for a distance of 125 miles, into the neighbourhood of Espinal, a range which faces the valleys descending from the main chain, and forces the streams to follow for a time a longitudinal course. In its construction it belongs, according to Codazzi, to the Eastern Cordillera, though separated from the main trunk by the valley of the Magdalena. North of 4° also, as far as Honda, the western chain of the Cordillera of Bogota skirts the left bank of the Magdalena, here flowing in a narrow valley, while between this chain and the Central Cordillera lies a broad depression, filled with plateaus of horizontally stratified tuff.

On the geological structure of the Central Cordillera, also, our information is very imperfect. The Cretaceous fossils, which Stübel collected between Pital and La Plata, and which Steinmann at first erroneously assigned to the Jurassic system, belong not to the Central Cordillera, but to the outlying chain of the Eastern Cordillera already mentioned, where, besides chalk, quartz-porphyry also occurs. The Central Cordillera proper, along the whole Moros route till the summit of the pass is crossed, consists of syenite, mica-schist, and other crystalline rocks; on the other side greenstone is visible. Acosta reports the discovery of limestone of the Cretaceous system in the neighbourhood of Chaparral. Between Ibagué and the foot of Tolima Stübel met with syenite and crystalline schists, and of these, according to Humboldt, the whole of the Quindio pass consists.

On the Ruiz route, which leads from Ambalema through Lerida to

Manizalas, Dr. Hettner observed that the formations were arranged in belts, and more conspicuously on the Herveo route from Honda through Mariquita to Salamina. After passing the tuffs which occupy the hollow between the Cordillera of Bogota and the Central Cordillera, he came into a region of granite, gneiss, and crystalline schists, which extended on the southern route as far as Libano, and on the northern to Manzanares, where it is about twelve miles broad. In this zone occurs a succession of valuable veins of ore, and from it is derived the auriferous detritus of the neighbourhood of Mariquita. On the surface the rocks have been disintegrated and converted into a red earth partaking of the nature of laterite. On the southern route the traveller passes immediately from this zone into the domain of volcanic rocks; but on the northern a belt of sandstone, clay-slate, lydite, etc., probably of the Cretaceous system, composes the sharp ridge of Picona, 9800 feet high. Beyond the Rio Guarino, andesite, with pumice and volcanic sand, first makes its appearance in a belt six miles broad, which is the material of the Paramo de Herveo, that is, the watershed between the Magdalena and the Cauca. Then follow Cretaceous rocks and crystalline schists, interspersed with porphyry, porphyrite, and diabase. West of Riosucio these are overlaid with coal-bearing strata, of which it is uncertain whether they belong to the Cretaceous system or are of Upper Tertiary age.

In the neighbourhood of Sonson (perhaps even at the Herveo Pass) the Central Cordillera sinks down, loses the character of a distinct mountain chain, and passes into the uplands of Antioquia, which extend westwards to the Rio Cauca and eastwards almost to the Magdalena, while to the north they sink towards the low grounds. As regards its orography this country is almost more strictly a *terra incognita* than the regions already described, for its complicated configuration is difficult to grasp. The ranges of most of the older maps are nothing more than the watersheds, and only on Von Schenck's do we find attempts at a more correct delineation of the mountains. With the few altitudes at present measured no one would dare, without personal investigation, to attempt the construction of a hypsometrical chart. In general it may be described as mountainous land culminating in the Paramo region at a height of 10,000 feet, and only in the south and west rising above 6500 feet. Its most massive elevation lies between the Rio Cauca and Rio Porce, continuing the direction of the chain occupying the country between the Rio San Juan and Rio Cauca. Its axis may be distinguished as far as the neighbourhood of Fredonia and Guaca, but farther north it spreads out to the highlands of Santa Rosa de Osos, in which the Rio Grande has eroded a longitudinal valley. These highlands advance to about the seventh parallel, but whether their northern spurs pass to the other bank of the Cauca or turn north-eastwards between Cauca and Nechi is absolutely unknown. Another axis of elevation, it would seem, runs to the east of the valley of the Rio Porce, the course of which oscillates between north-north-east and north-east, forming the watershed between this river and the eastern tributaries of the Magdalena. This also ends at 7° N. lat., and may occasionally pass over to the left bank

of the Rio Porce. In the line of elevation of the Central Cordillera a range also appears which is broken by the transverse valley of the Rio Negro between Guatape and Santo Domingo. Farther it cannot be followed on the maps, but it is possible that the lofty summits which rise above the forests of the western slope—Patiburu, Cerro Grande, Alto Tamar—should be considered as a continuation. To the north again this range once more becomes prominent, the extreme spurs of the highlands near El Banco on the Magdalena probably belonging to it.

The geological features of the highlands of Antioquia, as depicted in the notices of Boussingault and Degenhardt, are very similar to those of the Central Cordillera already described. To the north of Amaga a yellowish sandstone containing anthracite lies with conglomerate on clay-slate, and somewhat more to the south this formation overlies the felsite and mica-schists that compose the foot of the Alto de Amaga. To the south of Guaca (Heliconia) anthracite occurs, with a north to south strike and a dip to the west; somewhat to the east appears sandstone, which terminates a slope of greenstone, according to Degenhardt, and of syenite, according to Boussingault. Here, therefore, we have the same arrangement as is found to the west of Riosucio. If the deposits of anthracite be laid down on a small map after the map of Von Schenck and the topography of Uribe, which, indeed, owing to the want of exactness in the data, can only be done in general outlines, we arrive at the interesting result that they lie in a zone about twelve miles broad, interrupted by porphyry and greenstone, which runs on the whole from south to north, from the neighbourhood of Riosucio to Fredonia, Guaca, Sopetran, and Ituango. On the eastern side of this zone entirely different formations occur, defined by Degenhardt, and likewise Boussingault, as granite occasionally passing into syenite, overlaid with greenstone, porphyry, clay-slate, mica-schist, and gneiss. Only in the north, where the mountains descend to the lowlands, is coal found in the prolongation of this zone. The crystalline rocks are rich in lodes of ore, and the highlands of Antioquia are now the most important mining district of Colombia. Auriferous deposits are, it seems, found on the eastern slope, just as at Mariquita on the eastern slope of the Central Cordillera. For the rest, the geology of this slope is quite unknown.

With such an imperfect acquaintance with the orographical and geological features it is, of course, impossible to give a satisfactory account of the origin of the Colombian Andes. Only a few points are evident. Recent volcanic formations have had much less share than is usually affirmed in the building up of these Andes, for in the Central Cordillera they extend only to the fifth parallel, while in the Western they only just cross the frontier; they occur also at somewhat distant intervals. A peculiarity often remarked of the Colombian, as well as of the Ecuadorian, volcanoes, is that they lie on, or close to, the culminating ridge or in the Inter-Andine Hollow, and are nowhere found on the lower parts of the outer slopes.

The rocks which form the core of the Western Cordillera are gneiss and crystalline schists, granite, and greenstone, as well as ordinary stratified formations. The number of fossils collected is exceedingly

small, but the appearance of the sandstones, clay-slates, etc., is so similar to that of the undoubtedly Cretaceous, or partly, perhaps, Tertiary, formations of the Cordillera of Bogota, that these rocks must belong to the same systems. No trace of older formations has yet been discovered. Some of the crystalline schists are closely associated with a group of eruptive rocks which are usually described as greenstone, and it seems not improbable, though positive proof is not yet forthcoming, that they gradually pass into the Cretaceous strata, and have originated from metamorphism. The greenstones which traverse them seem also to be Cretaceous, for the youngest member of the system, the coal-bearing sandstone, does not contain them. In the crystalline zone which we have observed on the eastern edge of the Central Cordillera at lat. 5° N. these greenstones are absent; gneiss and granite are found beside the crystalline schists, and, accordingly, we probably meet here with older crystalline rocks. In general it would seem that the rocks in the Western are of more recent origin than those of the Eastern Cordillera. Crystalline rocks are nowhere found in the Cordillera of Choco; only the usual Cretaceous strata and the slate and greenstone formation are mentioned as occurring in the Western Cordillera; and older crystalline schists and gneiss have been observed only in the Central Cordillera, coal-bearing strata never appearing, as far as we know, east of the Inter-Andine Hollow and its northern prolongation. Similar conditions prevail, according to Wolf, Reiss, and Siemiradzki, in Ecuador, for the Eastern Cordillera of that country, corresponding to the Central of Colombia, consists of gneiss and crystalline schists, the Western of Cretaceous strata and greenstone, and the outlying ranges at its western foot solely of chalk (without greenstone) and Tertiary deposits.

In Colombia, as well as in Ecuador, all the rocks are tilted, and the strike, as far as the observations afford data for a decision, run in general from south to north, that is, parallel to the ranges. Accordingly, the Colombian Andes are apparently genuine examples of elevation caused by folding, and their upheaval took place chiefly in the Tertiary Period, for the Cretaceous (and Tertiary?) strata are folded, while the Quaternary lie horizontally above them. On the course and form of the folds and dislocations hardly any investigations have been made. The plains of Chaparral and Ibague, which, it should be noticed, lie immediately at the foot of the volcanoes Barragan and Tolima, point to the occurrence of caldron-shaped subsidences on the eastern edge. The Inter-Andine Hollow, as already remarked, may be compared with the cleft that runs along the Upper Rhone past Andermatt to the Upper Rhine, but it is much longer. Its breadth, on the other hand, that is, the distance of the ridge of the Western from that of the Eastern Cordillera, is almost the same as the space which separates the crest of the Bernese from that of the Central Alps; the Western Cordillera, just as the Bernese Alps, slopes steeply down to the cleft, and in both places younger formations occur in the hollow than on the ridges. The most essential difference is that in Colombia, and still more in Ecuador, volcanoes occur in the hollow, while they are absent in the Alpine depression. It is, therefore, possible that rupture has played a more important part in the

formation of the Andes. They can by no means be regarded as the work of erosion, as Reiss maintains, though their present form may be due to the action of water, and though the transverse valleys by which the Patia and other streams break through the Western or Eastern Cordilleras have been excavated by water like the transverse valleys of the Alps. Scarcely any investigations have been made into the nature of these valleys. Wolf tries to prove that the Rio Cuaillabamba has only recently carved for itself a passage to the sea from the basin of Quito. The basin drained by the Rio San Juan and the Rio Atrato was also, in position at least, determined by the architecture of the mountains.

Exactly in the direction of the Central Cordillera and the highlands of Antioquia the mountains of Santa Marta rise beyond the flood-plain of the Magdalena river. In these, too, though the west to east direction is on the whole more common than the north and south, the north-eastern or north-north-eastern strike prevails in individual sections, and the geological construction is almost identical with that of the highlands of Antioquia, whence one is tempted to assume that these mountains are a prolongation of the Andes of Western Colombia severed from them by rupture. Sievers, indeed, has combated this view, but he has thereby been led into the error of assuming the Cordillera of Bogota and its appendage the Sierra de Perija, which are, certainly, only outwardly connected with the mountains of Santa Marta, and are totally different in internal construction, to be true Andes. The true Andes are the Cordilleras of Western Colombia, and the Cordillera of Bogota, which converges with them about on the boundary between Ecuador and Colombia, has no intimate relation to them. Not only does it contain no volcanic rocks, but greenstones are also absent; the older crystalline rocks occur only in the north, and the southern part is composed almost exclusively of Cretaceous, and perhaps Tertiary, formations. At the foot of the Western Cordillera we meet with low chains of recent origin; the highest ridges are situated on the eastern side, and the pressure seems to have come from the east. To the north the Cordillera of Bogota diverges more and more from the Central Cordillera, approaching the Sierra de Perija close to the mountains of Santa Marta. The impression conveyed is that of an independent mountain system, which in its southern part abuts on the Andes, as in the case of the southern limestone Alps and the Dinaric Alps, as explained by Suess.

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

The Council, at a meeting held on July 26th, expressed its acknowledgments to the donors of the following works, which were presented to the library during the quarter ending June 30th.

	Presented by
Die Oro-und Hydrographie Sumatra's. Von J. F. Hoekstra.	Prof. Wagner.
A Collection of Treaties, etc., relating to British affairs in Malabar.	Mr. W. Logan.
Beiträge zur Geologie von Galizien. Folgen 2, 3, and 7.	Prof. Tietze.
Zur Geologie der Gegend von Ostrau.	,,
Hydrography of the Arid Regions.	Mr. F. H. Newell.
A Bibliography of Morocco from the Earliest Times to 1891.	Dr. Robt. Brown.
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Géographie du Moyen Age, and Atlas.	Dr. W. G. Black.
Report on Greece, by E. F. G. Law.	Mr. Richardson.
Report on British New Guinea, 1891-2.	Mr. J. P. Thomson.
Transactions of the Royal Society of Edinburgh, vol. xxxv., Part 3.	Mr. A. Silva White.
Scenes and Legends of the North of Scotland, by Hugh Miller.	Mr. John Gunn.
Physical Geography, by Sir John F. W. Herschell.	,,
Travels in England in 1782, by C. P. Moritz.	,,
Directory to Gentlemen's Seats, etc. in Scotland, by Jas. Findlay.	,,
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Paterson's Guide to the Rhine Provinces.	,,
Report on Sudbury Mining District.	Dr. Robert Bell.

Also for a number of pamphlets and other miscellaneous publications.

GEOGRAPHICAL NOTES.

By W. A. Taylor, M.A., F.R.S.E.,

Librarian, R.S.G.S.

EUROPE.

Visits to Spain and England in the Seventeenth Century.—The following note has been kindly contributed by Professor Paul Chaix, Corr. Member :—

The account of the visit of the Marquis of Vaubrun-Nogent (Colonel of Chevaux-légers, Maréchal de Camp, and Governor of Philippeville) to Spain, first published in French, was translated into German, and published in Frankfort in 1667. The Marquis entered Spain through Irun and S. Sebastian, where he was courteously received by the Governor, Baron de Wattewyl, a Swiss. His admiration of the Cathedral of Burgos shows that he was a stranger to the bad taste and the stupid contempt of Gothic architecture then prevailing in Western Europe, and exhibited in Burnet's letters. Lerma, whence Fr. Gomez de Sandoval y Rojas, the all-powerful and unworthy minister of Philip III., took his title of duke, he describes as a tasteless pile of buildings.

Madrid contained a large population, crowded together within an area not exceeding that of Utrecht or Leyden. Its dark, ill-paved streets were made indescribably dirty by the nightly discharge of the contents of 100,000 unmentionable utensils. The use of lanterns and torches was forbidden. The pride, laziness, and incapacity of the native workmen rendered living very expensive, and gave an opening to 40,000 Frenchmen, who passed as Lorrainers, Belgians, and Burgundians, and to Dutchmen, who gave themselves out to be Flemish, that they might not be molested on account of the war then in progress.

The palace of Buen Retiro was then in course of construction, and the residence of Philip IV. was situated at the western boundary of the city, where the Queen's palace now stands. The traveller was politely and kindly treated by the principal ministers, the Count de Peñaranda, Ferdinand de Contreras, and the wealthy and influential Don Luis de Haro, nephew of the former premier; but he does not fail to notice the scarcity of able statesmen among the great nobility. Spain was ruined by the expulsion of the Moors, and derived no advantage from the ill-gotten treasures of America, which were all spent in paying the enormous debts of the Government to French, Genoese, and Flemish merchants, on which account the Marquis likens Spain to a donkey laden with bars of gold and feeding on thistles. At a *funcion de toros*, or bull-fight, Don Luis de Haro had the honour of handing the keys of the stalls where the bulls were confined to the *alguazils*, and the royal jester threw himself valiantly into the arena, spear in hand. On the festival of Corpus Christi, the King and his Council marched in procession to the church of Nuestra Señora de Atocha. Mummers in huge pasteboard dresses amused the people with their gambols and indecent jokes during the intervals between the *autos*, or scenes of our Saviour's passion.

In Spain respectable ladies stayed at home, while their husbands squandered their wealth on courtesans, who, with painted faces, were seen driving on the Prado in carriages drawn by mules. Houses in Andalusia were so destitute of furniture that ladies of rank often squatted on the floor of their saloon or sat on blocks of stone.

At Aranjuez the Marquis was present at the dinner of poor lonely Queen Elizabeth, daughter of Henry IV. of France. Arrayed in most voluminous robes, she was served by three maids of honour on their knees, while her pages quarrelled in the next room, and pilfered from a poor dish of apples destined for her table.

M. de Vaubrun was accompanied by Count Serra, a Genoese nobleman, on his visit to the far-famed monastery of El Escorial. The library, very little resorted to by the monks, was of vast proportions, magnificently furnished, resplendent with gold and silver, and adorned with works of Titian. In the sacristy were jewels of immense value, one of which, a large cross set with diamonds, emeralds, and large pearls, the traveller volunteered to carry on his shoulders over the Pyrenees. The royal vaults, approached by a marble staircase, and decorated with pillars and tables of jasper, contained sepulchral niches for twenty-six occupants; the bodies of Charles V. and Philip II. were the first interred. In contrast to the rest of the building, the royal apartments were very poorly furnished, and beds had to be brought from Madrid when required.

There was much talk at the time of the unsuccessful attempt at escape of Charles of Lorraine, who had been treacherously kidnapped in Belgium, and was confined at Toledo simply for the offence of being sovereign of an unfortunate dukedom coveted by its neighbours, France, Spain, and Germany. Spain had been humbled by Cromwell, had lost part of her American treasure through the victories of Admiral Blake, and was involved in a desultory and ruinous war against her own oppressed subjects in Catalonia. All the available horses had been drawn from

Madrid for the use of the troops before Lerida, whither the knights of the orders of Santiago, Calatrava, and Alcantara, to the number of 1800, had been summoned. Ill-supported by France, the rebels were compelled to submit after a long and disastrous struggle.

The Marquis experienced considerable difficulty in making his way out of the country. A passport procured from Don Luis de Peñaranda did not save him from a long detention at Arcos, the last town in Castile on the borders of Aragon. He, however, resisted with spirit the extortionate demands of the Governor, Francisco Salazar, and, riding back to Madrid, laid his case before Don Luis de Haro. The irate king signed the passport with his own hand, and ordered Salazar to be brought to Madrid in chains. The prisoner was, of course, allowed to escape after a few marches. Vaubrun made his way to France through Roncesvalles : he is as lavish in praise of Aragon and its people as he is sparing of compliments to the Castilians.

The date of the Marquis' journey to England can only be guessed at. It took place after the Restauration, in 1660, but the narrative, though published in Germany in 1667, contains no mention of the Plague and the Great Fire of London in 1666. On reaching Calais in the company of some Polish noblemen, he was graciously offered a passage to Dover on board a vessel sent by the Duke of York for the use of Lady Fiennes, and crossed the Channel in ten hours. On his journey through Kent the traveller was struck by the beauty of an English landscape—a charming combination of hills and vales, woods and fruitful orchards, and parks well stocked with deer and free from French ornamentation. Canterbury was still a walled town, with narrow streets and houses overhanging the roadway. The venerable cathedral, 512 feet long, is noticed, and the French congregation which met in its crypt, and was finally dissolved, or rather ceased to exist, only a few years ago. Rochester, much larger than Canterbury, was noted for its stone bridge, the longest in England, with numerous arches and a parapet six feet high to prevent people's hats from being blown into the water.

In London the Marquis hired a comfortable room near what he calls the Public Garden, in order that he might enjoy the society of his friend Hobbes, who was then living with the Earl of Devonshire at Salisbury House. This Public Garden, apparently opposite Whitehall, is described as less extensive but more agreeable than the Place Royale (now the Place des Vosges), in the Marais at Paris. Lincoln's Inn Fields were laid out and surrounded by a low wall ; it is said to be larger than the Place Royale. The residence of the Archbishop of Canterbury at Lambers (Lambeth) is mentioned, and it is said that the Exchange was built on the Strang (Strand), a mercantile street. St. Paul's Churchyard was full of booksellers' stalls, and many others, scattered about various quarters of the town, contrasted most favourably with the *asneries* of Madrid.

St. James's Park, adjoining St. James's Palace, the residence of the Duke of York, was ornamented by a long canal and shaded with avenues of trees. The Queen was the solitary occupant of Somerset House, while a palace at Greenwich was tenanted by Henrietta Maria, the King's mother.

The Marquis of Vaubrun had the honour of an audience with the King and his cousin, the famous Prince Rupert, who was then engaged in scientific pursuits. He found imitators among the nobility : the Marquis of Worcester constructed a complicated pump ; Boyle carried out pneumatic experiments ; and Sir Robert Murray excited the interest of the public by his astronomical observations and his inquiries into the occultation of the satellites of Jupiter. Many noblemen, holding aloof from the frivolities of the Court, devoted themselves to the improvement of their estates and to mining.

Under the guidance of Hobbes, whom he found as friendly as ever after a separation of fourteen years, Vaubrun visited Westminster Abbey, where he was shown the Coronation Stone brought from Scone by Edward I., and was introduced to the Royal Society, where he was seated beside the Chairman, whose badge of office was a simple rod. Notwithstanding his scientific pursuits, Hobbes, in true English fashion, daily spent a part of his time in walking and playing at ball.

The traveller paid a visit to Oxford, a journey that occupied two days, the night being passed at Ossbrigh (Uxbridge), and was taken to Achtfields (Hatfield), where he was introduced by the Earl of Devonshire to the Earl of Salisbury, whose house, park, gardens, and art collections he greatly admired.

Lake of Constance.—The following results of the measurements executed by order of the Austrian Minister of Education are from a communication of Professor Penck :—

Areas in square miles.

	At a depth of 2 m. (about 6½ feet).	At mean waterstand.[1]	At high-water.
Main basin,	170·35	183·60	194·80
Untersee,	23·73	24·34	28·21
Whole lake,	194·08	207·94	223·01

Volumes in millions of cubic feet.

	At mean waterstand.	At high-water.
Main basin, . .	1,681.242·03	1,721,039·50
Untersee, . .	62,162·85	67,811·22
Whole lake, . .	1,743,404·88	1,788,850·72

Of the total volume of the main basin at mean waterstand over 40 per cent. lies within 50 mètres (164 feet) of the surface ; about 29 per. cent in the next layer, between 50 and 100 mètres ; 18½ per cent. between 100 and 150 mètres ; 9 per cent. between 150 and 200 mètres ; 3 per cent. between 200 and 250 mètres ; and the remainder below 250 mètres.

Mean Depths in feet.

	Mean level.	High-water.
Main basin, . .	328·47	316·93
Untersee, . . .	91·63	86·22
Whole lake, . .	300·78	288·02

A rise or fall of t feet corresponds to a difference of volume of about $(538{\cdot}52 + 2{\cdot}66t)\ 10{\cdot}763652t$ cubic feet.

Area and depths of the Swiss Lakes.—Professor Egli has communicated to *Petermann's Mitt.*, Bd. xxxix., No. 4., the following table :—

	Area in sq. miles.	Depth in feet.
Baldegg . .	1·95	216
Bienne . .	16·28	256
Constance . .	208·16	836
Brienz . .	11·56	856
Egeri . .	2·70	272
Geneva . .	223·10	1017
Greifen . .	3·26	112
Hallwyl . .	4·00	157

	Area in sq. miles.	Depth in feet.
Joux	3·59	112
Maggiore	82·73	120
Lowerz	1·10	43
Lugano	19·48	945
Morat	10·59	161
Neuchâtel	92·51	502
Pfäffikon	1·20	118
St. Moritz	1·22	144
Sarnen	2·86	171
Sempach	5·51	285
Sils	1·54	233
Silvaplana	1·10	253
Thun	18·50	712
Lucerne	43·77	702
Wallenstadt	8·98	495
Zürich	33·89	469
Zug	14·86	649

The areas and depths of the following lakes, with a surface of less than one square mile, are also given.

	Area in sq. miles.	Depth in feet.
Lago Bianco	·32	154
Lac des Brenets	·22	105
Burgäschi	·09	102
Campfer	·21	112
Davos	·21	177
Klön	·46	108
Lungern	·33	108
Märjelen	·16	154
Mauen	·22	30
Mooseseedorf	·12	72
Lago Nero	·03	39
Oeschinen	·44	207
Poschiavo	·62	276
Seelisberg	·07	121
Soppen	·09	92
Lac de Taney	·07	102
Türl	·19	72

From these data, Professor Egli remarks, it may be seen how much truth there is in the popular belief that the lakes, particularly the higher Alpine lakes, are unfathomable.

AFRICA.

The Chanler Expedition—A letter from Lieutenant von Höhnel in *Petermann's Mitt.*, Bd. xxxvi., No. 5, gives a description of the country along the Mackenzie river and the Guasso Nyiro. The former river was reached on December 10th, near where it enters the Tana over a fall 25 to 30 feet high. It is a rapid but insignificant stream, 10 to 13 yards broad and about 20 inches deep. It rises in a range 40 to 50 nautical miles distant in a north-westerly direction. In five marches across an uninhabited hilly country the party reached one of the sources of the river. Here the ground is entirely volcanic. The peaks of the range are extinct cones, and craters stand on their slopes and in the adjoining plain. Woods

of *Dum* palm, interrupted by grassy clearings, clothe the feet of the mountains, and extend some distance up their flanks. The native population may be estimated at 30,000; it is composed of several tribes, all speaking Bantu dialects, but connected ethnologically with the Kikuyu people. The range, called Jambeni, has a nearly uniform height of about 6900 feet, and its eastern foot stands about 2400 feet above sea-level. The leaders of the expedition learned that the Guasso Nyiro lay somewhere to the north, and that it flowed, not into the Tana, but eastwards to a swamp, lake, or district, called Lorian. The path followed the foot of the range, and then crossed its northern slope, whence, to the north-west, isolated mountains, the Ngassoni and Walke, could be seen. To the east the country was low and slightly undulating. The Guasso Nyiro was reached on December 24, in 38° 11′ E. long., and 0° 43′ N. lat. It flows along a hollow in a rocky bed of gneiss, and its banks are clothed with *Dum* palms. The gneiss formation extends along its left bank, while on the other side is a bare volcanic country. For a distance of several days' march the river flows through hilly country, often foaming over cataracts, and then runs quietly through a park-like region, and along the foot of a singular plateau of volcanic origin, with a relative elevation of 400 or 500 feet. It is called Marisi el Logwasambo. At 39° 3′ E. long. the river enters a wide plain covered with tall grass, and at 39° 38′ E. lat. appears to terminate in a swamp overgrown with reeds. On the journey back the party crossed the Jambeni range, and from its summit could plainly perceive the low ridge which unites it to the foot of Mount Kenia.

Saint Paul and Amsterdam.—The latter of these two little islands was first sighted on March 18, 1552, by the companions of Magellan on their homeward voyage. A century later, in 1617, a Dutch vessel, the *Zeewolf*, commanded by Captain Harwick Claesz van Hillegom, came during a fog upon the more southern of the islands, Saint Paul. But it was not till 1696 that any one landed on either of the islands. In that year the Dutchman, Willem van Vlaming, entered the vast crater of Saint Paul, which was then shut off from the sea by a low dyke. Of Amsterdam the first information was obtained by d'Entrecasteaux. Whether the fires he saw were due to volcanic action, or were caused by American whalers who had already begun to visit the islands, is uncertain, but there is no doubt that the vegetation of the island was more exuberant than at the present time, and that fumeroles must have been still emitting vapour. Volcanic action appears to have manifested itself on Saint Paul also in 1793, when Lord Macartney touched at the island on his voyage to China. In later years several vessels called at the islands and many whalers resorted thither to catch whales and eared seals. At length, in 1874, the French expedition for observing the transit of Venus determined the position of Saint Paul exactly, drew up a map of the island, and investigated the hydrography of its coasts and crater.

Both islands are of volcanic origin, being marine volcanoes that in consequence of a long series of eruptions have emerged from the depths of the ocean. And yet, though only 42 miles apart, they are very dissimilar in form, appearance, and construction. Whereas Amsterdam rises in a solid mass without salient points to a height of nearly 3000 feet above the sea, St. Paul is low, its surface rising gently from a continuous belt of ravined cliffs to a culminating ridge, with an average altitude of 660 feet—the edge of its vast broken crater. This dissimilarity is a consequence of their different modes of formation. Saint Paul owes its flattened form to the slow deposition of lavas which issued from one central crater, now invaded by the sea, but formerly containing a lake of fire like that of Kilauea in the Sandwich Islands. On the other hand, Amsterdam, with its flanks bristling with cones

of scoria, and its summit interrupted by craters, was evidently the scene of more violent eruptions. Saint Paul is of more recent origin than Amsterdam, and traces of activity still remain in warm springs and ebullitions of carbonic acid. Triangular in outline, the island has very different aspects on its south-western and north-eastern sides. On the former it appears as a low truncated cone, supported by a base of black cliffs, against which the waves break, rendering access impossible. On the other, two huge cliffs, rising to the highest altitude of the island, guard the entrance into the crater lake. From their bases two banks run towards the centre of the basin, leaving between them at low water a channel only 90 yards broad. The breach is due to a great fracture running from north-west to south-east, which caused the collapse of the whole western extremity, and plunged nearly a third of the island under water. The crater is 1750 yards in diameter at its edge, and slopes down to a circumference of 650 yards in diameter at the surface of the water. The bottom of the lake sinks abruptly to a depth of 65 or 80 feet, and then more gently to 160 feet. In the middle a cone of eruption rises around the greatest depth yet sounded, 226 feet. The slopes of the crater are covered with moss and grass, and are the only green spots in the interior of the island. The fauna and flora, introduced by man or accidental means, are by no means varied. There are no land-birds, but sea-birds are very numerous—albatross, petrels, terns (*Sterna melanoptera*) and penguins (*Eudyptes chrysolopha*). *Cetacea*, eared seals and fish swarm in the surrounding waters, and attract a number of fishing vessels.

The larger island of Amsterdam is better adapted for occupation. It has abundance of fresh water, which is completely wanting in the other island, has a richer vegetation and large tracts of cultivable soil. Saint Paul could only be utilised as a coaling station, for which its crater basin offers great facilities.—*Annales de Géographie*, April 15th.

The Jub.—Captain Bottego has marched from Berbera across Ogaden and the Webi to the Upper Jub, whence he despatched Captain Grixoni to the coast, which the latter reached at Brava. Captain Bottego remained behind on the Gannale, one of the two branches of the Jub, to complete the exploration of the country. On arriving at Bardera the party found that Captain Ferrandi had already visited the town.—*Boll. della Soc. Afr. d'Italia*, Naples, March-April.

AMERICA.

Greenland: Dr. Drygalski's Expedition.—Letters have been received from this explorer by the Berlin Geographical Society, in which are favourable reports of the health of the members of the expedition and the progress of their work. In March a strong east wind blew for a long time and temporarily freed the coast from ice, so that an excursion to Umanak was possible. The station has been erected at the foot of a rocky wall beside a fjord to which two glaciers descend, where all the conditions of the ice, animal life, etc., may be conveniently observed. On the journey to Umanak it was ascertained, by marks made in 1879, that two local glaciers had advanced since that time a distance of 1200 yards. In September of last year Dr. Drygalski was able to commence his examination of the inland ice. To ascertain its movement fifty-seven bamboo poles were fixed to a depth of $6\frac{1}{2}$ feet in the ice, and their position astronomically determined. The temperature was recorded all through the winter at depths down to $29\frac{1}{2}$ feet by Siemens' thermometers, and in December and January microscopical investigations were carried out. Last winter was particularly mild in West Greenland; in January the thermometer on several occasions rose above 50° F., and seldom fell below freezing point. Dry and warm east winds were probably the cause of this high

temperature. The snowfall also was slight, and the fallen snow was loose and easily blown away. The explorers are expected in Berlin at the end of September. —*Globus*, Bd. lxiv. No. 4.

MISCELLANEOUS.

Chilas, situated on the Indus to the north-west of Kashmir, has, with its territory, been incorporated with British India.

We have been requested to state that the martyrdom of **Margaret MacLachlan and Agnes Wilson**, on which doubt was thrown in the review of *Shearer's Guide to Stirling*, p. 447, is a well-authenticated fact.

Deutsche Rundschau, Heft 10, reports that at Paruschowitz, in the district of Oppeln, West Prussia, a boring has been carried to a depth of about 6570 feet. This, then, is the **deepest boring** now existing, surpassing those mentioned on p. 97 of this volume.

A *Tableau des Longeurs du Pendule aux différentes Stations de l'Empire Russe et de l'Étranger observées par des Savants russes*, which has been published by the Geographical Society of St. Petersburg, will be of great interest to those who have studied the form of the Earth.

Dr. H. R. Mill has been engaged this summer in surveying the **English Lakes**. Over 800 soundings were taken in Derwentwater, and Bassenthwaite, Coniston, Ulleswater, and Wastwater were also explored. The last-mentioned lake is the deepest, the maximum sounding being 250 feet, or more than three times that of Derwentwater. Samples of water were taken for examination by a specialist, and observations were made of the temperature at various depths.

The *Quarterly Journal of the Geological Society* for February contains an elaborate paper by Miss Maria M. Ogilvie, B.Sc., on the upper **Triassic rocks of Southern Tyrol**, which is of great interest to geologists. Miss Ogilvie's discussion of the stratigraphical succession, the palæontology, and the tectonic relations of the strata is in every respect admirable—her maps, sections, and diagrams affording a clear picture of the geological structure of that most interesting region.

Mr. Hurst, formerly attached to the Geological Survey of Queensland, has searched the bed of **Lake Mulligan**, a dry salt lake to the north of Lake Frome, South Australia, and found three nearly complete skeletons of *Diprotodon*, besides a large quantity of separate bones, as well as remains of a huge wombat, and of a huge extinct bird allied to the emu and moa. Two or three other animals, probably new to science, have also been discovered.—*Colonies and India*, July 1.

A fresh attempt to reach **Lhasa** is to be made by Dr. Sven Hedin, a Swede, who has already accomplished several journeys in Central Asia and Persia. Starting from Leh, he will follow Nain Singh's route as far as Tengri Nor, where he will form a camp for his followers, while he himself with a single companion visits Lhasa. From Tengri Nor he intends to journey north-westwards to Cherchen, and thence to Lob Nor, in order to ascertain whether a second basin exists to the north-east of that discovered by Przhevalski. In the autumn of 1894 Dr. Hedin hopes to arrive at Pekin.—*Petermann's Mitt.*, Bd. xxxix. No. 7.

In February last Sir W. MacGregor met at Thursday Island the Dutch resident at Ternate, Mynheer Bensbach, and Captain Jansen van Afferden, and proceeded with them to the south coast of **New Guinea**. Here a river, hitherto unknown to either British or Dutch, was discovered, and named the Bensbach, after the Dutch Commissioner. This, it was agreed, would form a good starting-point for

a new boundary. One very important feature of the new frontier is that by an exchange of territory a strip of country east of the Fly river, which hitherto has been under Dutch administration and a source of inconvenience to the British Administrator, is now transferred to the control of the latter.

At a meeting of schoolmasters held at Oxford on May 20, an **Association for the promotion of Geographical Teaching generally** was formed. It was allowed that the standard of geographical knowledge among schoolboys was unsatisfactory, and far inferior to that attained in foreign schools. The new Association might approach examining bodies, representing to them how often the papers set are of a nature to encourage "cramming"; it would also serve as a medium for the dissemination of new ideas and improved methods of teaching geography; and in time might arrange for geographical museums. Such a society would also be the best means of securing the help of the Royal Geographical Society and other bodies. For the present the Association is commencing work by seeking to promote the teaching of geography by means of photographic slides, and has invited schools to subscribe towards the cost of a number of sets, and to give facilities for testing the new method. When some of the sets are ready, the question of a Scottish branch will be discussed. In the meantime, any one wishing to join the Association should apply to B. Bentham Dickinson, Esq., Bloxam House, Rugby.

Dr. Robert Bell, of the Canadian Geological Survey, sends us a copy of his Report on the **Sudbury Mining District, Canada**, which is described as being composed chiefly of Laurentian, Huronian, and Cambrian (?) rocks. The Laurentian series consist chiefly of gneiss and hornblende-granite; the Huronian rocks appear to be largely of volcanic origin, interbedded with which occur derivative sedimentary rocks. Both igneous and sedimentary rocks are in places more or less metamorphosed. The so-called Cambrian rocks consist of blackish volcanic breccia, with here and there associated black slate, and a series of dark argillaceous sandstones with shaly bands. These strata are less altered than the underlying Huronian, of which they may form the superior portion, or they may possibly belong to the Lower Cambrian. They appear to be unfossiliferous. Ores of nickel and copper are always associated with certain igneous masses ("greenstones"), especially at the contact of these with other rocks. Galena and zinc-blende are also met with in small quantities in black slate and volcanic breccia, and gold-bearing veins of quartz appear to be numerous. The Report is accompanied by Appendices containing Notes on the Microscopical Character of the Rocks of the District, by Prof. G. H. Williams; Levels of Lakes above the Sea, and List of Elevations on the Canadian Pacific Railway; Report by H. H. Lyman on Lepidoptera collected by Dr. Bell; and Meanings of Indian Geographical Names in the country round Sudbury.

NEW BOOKS.

Memoirs of my Indian Career. By Sir G. Campbell, M.P., K.C.S.I., D.C.L. Edited by Sir Charles E. Bernard. With Portrait. 2 vols. London and New York: Macmillan and Co., 1893. Pp. 305 and 428.

Of the men who have distinguished themselves in India few, if any, have had a more varied experience than Sir G. Campbell, or been intimately associated with more of the different provinces and peoples which make up our great Indian Empire. After serving his apprenticeship in one of the Rohilcund districts of the

North-Western Provinces he was, when only twenty-two years of age, placed in independent charge of a subdivision in the Cis-Sutlej portion of the Sikh Country, which he held during both the great Sikh wars and for some time after the final annexation of the Panjab. On return from furlough in 1854 he was again employed in various capacities in the North-Western Provinces, but before long he was transferred to the Panjab as Commissioner of the Division to which his old district belonged, and remained there till close on the outbreak of the Mutiny. During that great struggle he was employed on several occasions as Civil Officer with troops in the North-Western Provinces. After the Mutiny he served for several years as Judicial Commissioner in Oudh, then as a Judge of the High Court at Calcutta, then as a Famine Commissioner for Orissa, then as Chief Commissioner of the Central Provinces, and finally as Lieutenant-Governor of Bengal. Thus the whole of India, except Madras and Bombay, may be said to have been the scene of his activity. Nor was it only over a wide area and among varied circumstances that he was employed. His service fell at a time when, in all these different provinces, administrative problems of the greatest importance were pressing for solution, and there is hardly one of the great Indian political questions of the last half-century in regard to which he was not called to take a definite side, and to the solution of which he did not make a valuable contribution. He was also brought into intimate personal relations with almost all the men who took a leading part in the events of his time, and whose names are now conspicuous in the pages of history, and he thus had excellent opportunities for forming a correct estimate of their character and ability. But if his career was thus one of great opportunities and varied activity, not less conspicuous were the ability, energy, and consistent regard to duty and principle which Sir George himself displayed throughout his long service. As he himself says, he always threw himself heartily into whatever he had to do, and worked with a will. He had an omnivorous desire for information, and was, as he admits, dreadfully wanting in the faculty of idleness. If his desire to know and understand was insatiable, so his energy was untiring and his activity unceasing. Though he had definite principles on most subjects, by which he was guided in action, he was no doctrinaire. What he saw of warlike operations led him to think that in war the great thing is "energetic common sense," and the phrase may be taken as fitly describing one, and that not the least important, side of his own policy as an administrator. He evidently had a shrewd insight into human nature, did not often forget that it had to be reckoned with, and was, by natural temperament and as the result of much experience, ready to make large allowances for men of alien race and culture. Plainly, then, Sir George Campbell's Indian career was one of active and distinguished service, the story of which was well worth telling, and it was even of importance that the valuable results of his varied experience should not be left unrecorded. Fortunately, Sir George has himself written the memoirs of his Indian career. The task could not have fallen into better hands. In these two volumes he has produced a work of the greatest interest and ability, which is a valuable contribution at once to one of the most delightful forms of literature and to the history of Indian administration during the last fifty years. Sir George, one soon sees, must have written rapidly, with more thought for the matter and substance of what he had to say than for the style. But if in this respect there is an absence of finish and distinction, he is always clear and forcible—never vague or prolix. Very probably also the final touches, which seem wanting at places, would have been supplied had he been spared to make a final revision as his work passed through the press.

It is impossible to give any adequate idea here of the innumerable topics on which he gives his impressions or his more mature conclusions. There is hardly

a phase of Indian life or question of Indian administration that does not come under review, and on which he has not something characteristic to say. Whatever the subject may be, his judgments are always trenchant, incisive, and carefully considered. They are not all of equal value, nor are they all adequate and final, but they are invariably characterised by shrewd and keen insight, and express a view that, if it is not decisive, cannot be ignored. On some of the more important questions, such as those of Land Tenure, Tenant Right, Municipalities, District Administration in Bengal, etc., he has taken pains to give to the exposition and defence of his policy a fulness which gives it a substantial value. To the general reader one of the most attractive and interesting sections will be the narrative of events in the Mutiny and the discussion of the causes of that catastrophe. In no part of his work does he give more abundant evidence of his well-balanced judgment and of the absence of exaggeration, or write with more spirit and animation. But he is perhaps at his best in what was the most delicate task he undertook, viz., his critical estimation of the many distinguished men with whom he came in contact in the course of his service. The Governors-General from Hardinge to Northbrook, Lord Clyde and the military heroes of the Mutiny, Thomason, Colvin, and many other civilians, are all briefly characterised as they showed themselves to his sharp eye in terms that gave a distinct impression of being true to the life. While frankly independent in his attitude, judging for himself regardless of current beliefs and prejudices, incapable of flattery or exaggeration, and outspoken when he sees ground for condemnation, he is transparently fair even when he may be mistaken, and all the more value attaches to the praise which he gives when he thinks it is deserved. Sir George has in this memoir left what will be the fullest expression and best monument of himself, and one that will endure when his failure to adapt himself to the unfamiliar atmosphere of English political life has long been forgotten.

Where Three Empires Meet: A Narrative of Recent Travel in Kashmir, Western Tibet, Gilgit, and the adjoining Countries. With a Map and 54 Illustrations. By E. F. Knight. London and New York: Longmans, Green, and Co., 1893. Pp. xvi + 495. *Price* 18*s*.

This handsome volume embraces a record both of travel and of war. The author, during about a year's absence from England, travelled in Kashmir, Ladak or Western Tibet, Baltistan, and Dardistan; and after having taken an active part, as a volunteer, in the hard-fought campaign in which the insurgent tribes of Hunza and Nagar were defeated and reduced to submission, ascended the Kanjut valley till he reached the very edge of the Pamir plateau, called the 'Roof of the World,' where meet the three greatest of existing empires—the British, the Russian, and the Chinese. He arrived in Kashmir in 1891, early in April, and thus at the very season when the 'Happy Valley' is seen to greatest advantage. Of the magic beauty of its scenery he gives glowing descriptions, which the reader follows with unflagging interest. There is scarcely, indeed, a dull page in his book; for while he excels in picturesque description, he is no less effective in relating his travelling adventures, and in hitting off the characteristics of the singular races with which he came in contact. He had not been long in Kashmir without realising that things were there in a transitional state, the Indian Government having not long before sent some British officers, both civil and military, to control the administration, which had become hopelessly corrupt, and to introduce measures of reform such as those by which Egypt has so largely benefited. Mr. Knight testifies to the good work which is being done by these officers, and to the confidence in their

justice with which they have impressed the minds of the people. He spent some six weeks in the enchanting valley, and then left its capital, Srinagar, for Leh, the capital of Ladak, in company with the celebrated traveller Captain Bower. They reached Ladak by the Zoji Pass, which, though 11,500 feet above the sea, is the lowest depression of the Western Himalayas. This colossal range divides the Kashmir State into two nearly equal but strikingly contrasted portions, the southern being the Kashmir valley, and the northern that desolate plateau of immense altitude extending northward to the Karakorum mountains and westward to the Hindu-Kush, which was wrested about fifty years ago from China by the Sikh and Dogra rulers of Kashmir. This plateau is the highest inhabited country in the world, its very valley-bottoms being higher than Mont Blanc. It is described as mostly a desert of bare crags, with vast arid table-lands without either forests or pastures, though here and there diversified with tiny green oases artificially created, and only kept in existence by assiduous irrigation. It is a cloudless region, always burning or freezing under the clear blue sky, so that one may at the same moment be in danger both of sun-stroke and of frost-bite. The Ladakis themselves are as singular as their surroundings. They wear the long pig-tail, are polyandrous, do most of their incessant praying by machinery, believe in metempsychosis, and with the signs of their magic rites fill all the land. They are very dirty withal, for they never wash themselves. They are not, however, without their good points, being truthful, honest, and hospitable. The travellers reached Leh, which is 260 miles from Srinagar, in sixteen days. It is situated at a distance of five miles from the Indus, and is imposing in its appearance. It is a place of great importance, as it lies about half-way between the markets of India and those of Central Asia, and has thus become the terminus for the caravans of both regions. At two marches from it is the great Himas lamasery, at which is held an annual fair, simultaneously with the celebration of one of the strangest religious festivals in the world—a sort of mystery play, of which the leading feature is a devil-dance. Our author was very forcibly struck with the resemblance between much of the pageantry and forms of Buddhism which he saw during the festival and those of the Church of Rome. On June 27 he left Leh to return to Srinagar by way of Skardu, the capital of Baltistan, and Gilgit, in Dardistan—that outpost of the Indian Empire which guards the approaches to it over the Hindu-Kush and Pamir passes. From Gilgit he travelled to Srinagar by the military road, which was then under construction, but soon returned to Dardistan to take part in the Hunza-Nagar war, which he has racily described in the work before us. It is, we think, a work entitled by its high merits to take a permanent place in the literature of travel. It contains numerous illustrations reproduced from photographs, and a very useful map. We may point out that it was the Beas, or perhaps the Satlej, which formed the limit of Alexander the Great's Eastern conquests, and not, as Mr. Knight says, the Jhelam.

Australische Reise. Von R. v. Lendenfeld. Mit Illustrationen. Innsbruck: Verlag der Wagner'schen Universitäts-Buchhandlung, 1892. 8vo. Pp. 325.

The author of this work spent five years (1881-1886) in the Australian colonies for the purpose of studying the marine life of the coast-lands. But although this research employed most of his time, he yet took the opportunity of making himself acquainted with the land and its occupants. The scientific results of his journeys having been published elsewhere, he deals in these pages with matters of more general interest, giving some account of his wanderings in the colonies. Dr. Lendenfeld has a lively style, and carries his reader along with him while he describes his experiences of kangaroo drives, of rough-rides and camping-out, of mountain ascents, and other adventures. Nor does he fail to present us with an

excellent account of the various mammals and birds, native and introduced. Perhaps the portions of the book which will have most interest for English readers are those in which are described the Alps of Australia and New Zealand. In the former Dr. Lendenfeld, as is well known, discovered glacial striæ, *roches moutonnées*, and other traces of an Australian Ice Age. The upper part of the Wilkinson Valley he describes as well glaciated up to a height of 600 feet, showing that a glacier of that thickness had persisted there for a long time. He makes brief reference also to the subsequent discovery by Mr. J. Stirling of similar ice-markings on the Kosciusco plateau, and by Mr. Brown of glacial striæ in the Mount Lofty group near Adelaide. The author concludes from these and his own observations that the Australian Alps have formerly supported glaciers, which dropped their moraines at a height of 3200 feet above the sea. The highest point in Australia is Mount Townsend (7350 feet). Very interesting also are his descriptions of the glacial phenomena of New Zealand. He advocates the view that the deep depressions in the bottoms of the fiords of that region have been excavated by the great glaciers of the Ice Age, and many striking observations and cogent arguments are brought forward in support of this opinion. The mountains of New Zealand are described as showing a configuration much like that of the European Alps, but their valleys, as Dr. Lendenfeld points out, differ considerably in character from the glacier-valleys of Switzerland. The Tasman Valley, for example, which may be taken as the type of a New Zealand glacier-valley, shows a broad flat bottom, from which the adjacent slopes, for the most part grassy, rise abruptly and somewhat steeply. The gradient of the bottom is very gentle, and continues the same from the glacier at the head to the lower end of the valley. The author ascended the peak named after Dr. Hochstetter, and determined its height above the sea to be 2840 metres. A sharp ridge of névé forms the summit.

The work is well printed, and a series of very beautiful plates from the author's drawings and from photographs adds greatly to its interest and value.

La Grèce Byzantine et Moderne. Essais Historiques par D. Bikélas. Paris: Librairie de Firmin-Didot et C^ie^, 1893. Pp. viii + 435.

These essays fall into two groups. In those of the first group Mr. Bikélas attempts to rehabilitate the reputation of the Byzantine Empire, to vindicate its title to the respect and gratitude of Modern Europe, and to show that the contemptuous scorn with which it is generally regarded is due in a great measure to prejudice and to ignorance of many glorious passages in its history and of the prosperity which for long periods it enjoyed. He expatiates on the great service which it rendered by developing, improving, and codifying Roman law, and by fostering industry and commerce, art and letters, and argues that even if it did nothing more, it at least fulfilled its function of preserving the old Roman civilisation until Western Europe was fit to receive it. He shows that it succeeded in doing this and in maintaining its existence for a thousand years after the fall of the Western Empire only because of the ability and energy displayed by many of its rulers and generals, the excellence of its organisation, the extent of its resources, and the spirit of its people. Mr. Bikélas is not the first to take this view. The feeling has been growing, both in England and on the Continent, that the depreciatory estimate to which the great works of Montesquieu and Gibbon gave currency is unjust. Amongst ourselves the labours of Finlay, Freeman, Bury, and others, have done much to correct it and to set the facts in a truer light. But erroneous impressions are still prevalent, and there is ample room for advocacy of the views supported by Mr. Bikélas. He argues his case with great ability and

literary skill. A Greek himself, he naturally displays a more genuine enthusiasm and sympathy than any foreigner can be expected to feel, but he is temperate and reasonable. He is not blind to the defects inherent in the Byzantine system, nor does he seek to minimise them, but he is able to set off against these an array of achievements and services which redound to the credit of the Empire and justify his contention. The second group of essays is concerned with the history of Modern Greece since the outbreak of the War of Independence, and possesses even more value than the first, for here Mr. Bikélas is on ground which is not preoccupied, and is dealing with questions of vital importance to Western Europe in regard to which Englishmen are much in need of enlightenment, while few men are more fitted than he to be their guide and instructor. With admirable force and clearness he convincingly establishes two important truths which ought to be borne in mind by all who have to deal with the great Eastern question. These are that Turkish rule in Greece was oppressive, cruel, and barbarous to a degree that it is hardly possible to exaggerate, and that no sooner was this yoke removed, and by the gradual substitution of an orderly civilised administration the energies of the people permitted to have free play, than they embarked on a career of progress in which the results achieved during the last fifty years, if due account be taken of the depth of degradation to which the country had been sunk, are almost miraculous. The narrative of the controversies and negotiations that preceded the recognition of the independence of Greece is not very pleasant reading to an Englishman. It is with some shame that one finds how ignorant our statesmen were of the true character of Turkish dominion, how blind to the results to be expected from its removal, and how strenuously they exerted their influence to contract the limits of free Greece and to launch the new kingdom with hampering conditions which almost compelled failure, and which proved the source of countless evils and difficulties. To any one wishing to understand how Greece has struggled with those difficulties and in spite of them has prospered, what her legitimate aims and aspirations now are, how they may and should be satisfied, and what is the wisest policy for his own country in regard to them, these essays of Mr. Bikélas can be confidently recommended. In conclusion, it may be noted that seven of the essays contained in the volume were translated into English by the Marquis of Bute, and published in 1890 under the title *Seven Essays on Christian Greece*.

Une Excursion à Ithaque. Par Ernest Seillière. Dessins de Pierre Vignal d'après les Photographies de l'auteur et carte de l'île d'Ithaque. Paris : Librairie de l'Art (L. Allison et Cie.), 1892. Pp. 76.

To every lover of the *Odyssey* (and who that knows that immortal epic is not such ?) this charmingly written and beautifully illustrated account of an excursion to Ithaca and of six days spent there will be most acceptable. M. Seillière rambled over the whole island with the *Odyssey* in his hand, seeking to identify the places described or referred to by the poet. He shows that in the case of the great majority of the references the accordance with the actual features of the island is such as to establish beyond reasonable doubt that they were based on personal knowledge of the locality, while the few passages which seem to oppose this conclusion occur in episodes which on other grounds may be assigned to a later minstrel. The question is argued in each case with excellent taste and judgment and with a refreshing absence of dogmatism or pedantry : the references to scholars of other nationalities are unusually generous, and the personal experiences are briefly and graphically narrated with admirable grace and lightness of touch. No

one will read this delightful book without conceiving a liking for the author himself, or without feeling that he has done something to give more vividness and reality to the scenes and descriptions which have charmed so many generations of men. M. Seillière, who in his introduction gives the bibliography of the subject, does not appear to have seen the papers by Mr. Stillman, which originally appeared in the *Century Magazine* in 1884 under the title "On the Track of Ulysses." Mr. Stillman mentions one argument for holding Dexia rather than Vathy to be the harbour of Phorkys, where Ulysses was landed by the Phæacians, in regard to which we should like to hear what can be urged by M. Seillière, who inclines to the other view, but does not notice the point made by Mr. Stillman.

Reise durch Montenegro, nebst Bemerkungen über Land und Leute. Von Dr. Kurt Hassert. Mit 30 Abbildungen nach den Aufnahmen des Verfassers, und einer Karte. Wien: A. Hartleben's Verlag, 1893. Pp. vi + 236. *Price* 5 M.

We have some reason to believe that the popular idea which pictures the people of Montenegro as a bloodthirsty race of mountaineers, who go about bristling with weapons, and make slaying and killing their principal occupation in life, is not yet extinct; but Dr. Hassert's five months' travel, on foot and almost unarmed, across the little barren mountain-land, in all directions, without encountering the least danger or annoyance of a serious nature, convincingly demonstrates the falsity of this antiquated notion. The greatest difficulties he had to contend with on the part of the people were their childish curiosity and *naïveté*. The other difficulties that have to be surmounted in journeying through Montenegro are such as meet every traveller in a barren, rugged, mountainous region, where there are often no roads and only the most primitive accommodation. Dr. Hassert's narrative is not such as will attract readers by reason of its exciting adventures or picturesque descriptions. Its principal merit is one that will commend it rather to the studious geographer; it is, in sum and substance, a most useful itinerary, crammed with topographical information of the most minutely detailed character, and covering not only the chief seats of the population, but also the less known, because wilder, parts of northern Montenegro. He even proceeded up to Scutari, and was only deterred from penetrating into the Albanian mountains by the notorious insecurity that prevails amongst the lawless inhabitants of that region. Two or three striking facts, apart from topography, may be fittingly alluded to. Near Rudenice in the Piva valley, in northern Montenegro, Dr. Hassert saw several ruined tombs and monuments of the ancient Christian sect of the Bogomiles or Patarenes, who, after the crushing disaster of the Field of Blackbirds (Kossovo, 1389), embraced Islam, and have for their modern descendants the Mohammedan Bosniaks of Austria. He also tells a strange story of a village priest who was totally ignorant of the existence of Germany, asking where it was, how big it was, and whether it had mountains like those around his own village. Dr. Hassert estimates the population of Montenegro at 200,000 to 250,000. Several of the numerous illustrations are ineffective from want of sharpness and clearness.

La France en Algérie. Par Louis Vignon, ancien Chef du Cabinet du Ministre des Finances. Paris: Librairie Hachette et Cie, 1893. Pp. 552.

M. Vignon's work is a contribution of much weight and value to an inquiry which is greatly exercising the minds of thoughtful and patriotic Frenchmen. It follows the lines of the programme of investigation laid down by the Special Commission of the Senate, and gives the results of the experience and independent examination of Algerian affairs obtained by ten years of study of French colonisation, and especially of the colonisation of the northern shore of Africa. What is

the actual situation at this moment of France in Algeria? What are the fruits of the great efforts put forth in the course of the last sixty years to conquer, govern, settle, and "assimilate" the country? What line of policy has been pursued towards the indigenous population, and what measure of success or failure has it met with? These are among the questions which M. Vignon propounds and sets himself to answer. He first tells the story of the conquest, and then in two long chapters he describes the country which France chose as a field of settlement, and the native races, their manners and customs, religion, and manner of life, among whom the attempt was thus made to plant European civilisation. He passes on to describe at length the means, the methods, and the consequences of this adventurous "introduction of France into the Mussulman world;" his object being to bring out sharply and clearly the existence and relations of the two formidable problems with which France has to deal—the "Colonial Question" and the "Native Question." The treatment of these subjects is luminous, candid, and impressive. M. Vignon reminds his countrymen that after sixty years of occupation they are still "in an enemy's land." Material conquest has been completed, but moral conquest hardly begun. There is much to admire in the façade of the great edifice which the arms and industry of Frenchmen have erected on the opposite shore of the Mediterranean; but it is ill founded. Errors of a serious character have been committed in the administration and legislation of the colony, many or most of them arising from a tendency, strongly marked in French enterprises of the kind, to begin at the top rather than at the bottom, and to manage everything from a centre and from a distance. But more important than the educational, the judicial, and the other matters in which reform is required in the system of Algerian rule is, in the author's opinion, the economic question. The masters of the country have still to take in hand the task of endeavouring to view the material interests of the indigenous inhabitants from the native standpoint, and of striving to improve their methods of culture and their powers of buying and selling, and their prosperity and well-being generally. One important branch of his subject M. Vignon promises to deal with more fully in another work. He regards it as a necessity of France's position in Algeria that she should secure her position in the desert region to the south in order to guard the posts and entrances by which the streams of trade and of fanatical impulse find their way into the colony from the Sahara and the countries beyond. The development of this idea, which is a favourite one in France with men who are far more rash than M. Vignon and not so well informed, promises to be of exceeding interest to the geographer as well as the politician and the merchant.

Die Vereinigten Staaten Nordamerikas in der Gegenwart. Sitten, Institutionen, und Ideen seit dem Secessionskriege. Von Claudio Jannet, Professor der Social-ökonomie am Institut Catholique de Paris, und Dr. Walter Kämpfe, Mitglied der Société Internationale d'Économie Sociale in Paris. Freiburg im Breisgau: Herder'sche Verlagshandlung, 1893. Pp. xliv + 704. *M.* 8.

The pages of this magazine are not adapted for a full discussion of the very many topics treated of in this bulky volume. It deals only incidentally with geographical matters. The writers' object is rather to set forth their observations and views upon the social aspects of the United States, taken in that wide sense of the term which ranges from a critical study of the constitution to a passing remark upon a fleeting popular fancy. The work was penned originally in French; but the volume before us embraces much more than M. Jannet's own statements, deductions, and arguments. The German translator, Dr. Kämpfe, has enlarged the text with copious passages from his own pen, and states that he has also, with

the express authorisation of Dr. Jannet, considerably condensed the original in many places where it seemed to him desirable to do so. The writers draw a very darksome and discouraging picture of the public institutions, or rather of their working, in the United States, and dwell with almost appalling frequency and emphasis upon the corruption, dishonesty, and moral laxity which vitiate almost every department of public life, as well as many phases of private life. The book, which seems soberly enough written, is worthy the attention of students of political and social philosophy, and, indeed, of all who feel any degree of lively interest in the great nation on the other side of the Atlantic. There is a most complete analytical table of contents, as well as an index—this last, however, wholly inadequate, considering the vast number of points raised and discussed.

The History of South Australia from its Foundation to the Year of its Jubilee. With a Chronological Summary of all the Principal Events of Interest up to Date. By Edwin Hodder. With Two Maps. London: Sampson Low, Marston, and Company, Limited, 1893. 2 vols. Pp. xii + 391 and vii + 400. *Price* £1, 4*s*.

These two handsome and substantial volumes are apt, at first sight, to raise a doubt as to whether it has been possible to fill them with really interesting and important matter, seeing that the foundation of the colony, counting from the date of landing of the pioneer colonists, was so recent as 1836. A very superficial examination of the pages, however, is sufficient to show that, although the history is treated in abundant detail, hardly a word has been uselessly inserted; and no incident of trifling importance, unless it had a direct influence on the course of events, has received more than bare mention. Mr. Hodder gives his narrative faithfully, luminously, and in a fascinating manner, carrying the reader sympathetically along with him from one event or period to another. He is an enthusiastic admirer of the colony, with a strong faith in its future, and so language of a superlative character, noticeable now and again, cannot be severely commented upon, as the author's honesty of intention is everywhere apparent.

These volumes, as we are informed in the preface, are the result, to a large extent, of the labours of the late Mr. George Fife Angas, a warm well-wisher and a munificent benefactor of the colony in its disasters and early days of need, when the Government had no money to meet claims against it, and the Governor's bills were dishonoured at home. Mr. Angas collected a great mass of material in the shape of documents of various kinds, and South Australia is to be congratulated on their having fallen into such competent hands as those of Mr. Hodder, who has largely and carefully supplemented the information thus collected by researches of his own among books, manuscripts, and newspapers. The result is as complete and accurate a history as need be wished for.

South Australia presents, in the manner of its foundation and early history, a striking contrast to the record of many of our colonies. Here we arrived without war or bloodshed, and without the almost as deadly curse of the presence of the convict element, which proved so detrimental to the young life of some of the other Australian settlements. The settlers were honest and industrious, some of them capitalists, and most of them attracted, not only by the reported richness of the soil and the salubrity of the climate, but by the interest they felt in an entirely new experiment in occupying a far-away portion of the globe. Exigencies of space compel us to forbear from making even the smallest epitome of the narrative of that experiment and its results, which still influence the course of events; but we have no hesitation in recommending the reader to inform himself on these points by the perusal of this elaborate and deeply interesting treatise.

The index is excellent, and a map and diagram, which are clear, are accommodated in pockets in the binding.

Wanderings in Spain. By AUGUSTUS J. C. HARE. Sixth Edition. London: George Allen, 1892. Pp. 274. *Price 7s. 6d.*

"He who would really see Spain," says Mr. Hare, "must go prepared to rough it, must be unembarrassed by a courier, must be content with humble inns, coarse fare, windows often glassless, vehicles always jolting, and, above all, must put all false Anglican pride in his pocket, and treat every Spaniard, from the lowest beggar upwards, as his equal." The traveller must also not expect too much. "He must take Spain as he finds her; she is not likely to improve; she does not wish to improve." Again, "Spain is not a beautiful country." It is "not the least like Italy; it has not even the beauty of the greater part of France." He considers "Granada the climax of the beauty and interest of Spain, a place which alone is worth all and tenfold the fatigue and trouble which may be undertaken to reach it."

The interesting volume under review consists of a series of letters written in 1871-72 from various parts of Spain. We thus obtain graphic sketches of Barcelona, Cordova, Seville, Cadiz, Granada, Madrid, and many other places, the volume being well illustrated, but containing neither map nor index. It is but fair to add that even Spain has changed somewhat during the past twenty years, and that travelling is now much easier and more expeditious than in 1871-72. The police have also the gipsies much better in hand than when Mr. Hare visited Granada.

Abessinien. Aus dem Nachlasse von E. F. A. MÜNZENBERGER. Herausgegeben von JOS. SPILLMANN, S.J. Mit 38 Abbildungen und einer Karte. Herder'sche Verlagshandlung. Freiburg im Breisgau, 1892. Pp. 156 and Index.

The Rev. E. F. A. Münzenberger died at the end of 1890. He was well known for his interest in Abyssinia, and had already published a book of considerable merit entitled *Afrika und der Mohammedanismus.* The editor has only had occasion to introduce a few additions into the text, which is published as it was left by the author. The book is divided into three parts, the first describing Abyssinia and its inhabitants, the second dealing with the history of the country, and the last with its religious and political position at the present day, and the country as a field for a European colony. The author was evidently a close student of Abyssinian history, as he has been able to give an accurate account of everything of importance to the general reader. He came to the conclusion that Abyssinia was one of the most fertile regions in Africa, and that it would be an admirable colony for any European Power. The illustrations are excellent.

Die Wahrheit ueber Emin Pasha; die ägyptische Aequatorialprovinz und den Ssudan. Von VITA HASSAN. Erster Teil. Berlin: Dietrich Reimer, 1893. Pp. 223.

The author of this book, Vita Hassan, who was apothecary for many years in the Equatorial Province, did not live to see the publication of his work, the first volume of which is before us. He died on the 14th of March this year. He was born in Tunis in 1858, his father having been dragoman at the Italian Consulate. In the preface he wrote for the book, he says that he considered himself called upon to write it because he had lived with Emin Pasha for ten years, and therefore knew him better than any other European. He does not wish the book to be considered a flattering account of his chief. He says he has told the truth, and has, without

bias or favour, stated where he considered Emin made mistakes. At the same time, he does not seek to hide Emin's virtues, virtues which he thinks were more those of a missionary than of a governor or a soldier, and he seeks to show that the weakness which Emin at times exhibited was in consequence of his innate goodness of heart, a goodness which he says that Stanley and others acknowledged but failed to understand. In the present volume we have a vivid and apparently accurate picture of the state of the Soudan up to the end of 1889, and any one interested in its condition will obtain much valuable information not only with regard to political, but also to ethnographical matters. The author's account of what happened in the Soudan tallies remarkably well with what one knows from other sources; but, at the same time, it is perfectly evident that he has not written a compilation, but an original and highly interesting narrative. The result of the appearance of the relief expedition and the revolt of Emin's troops will be dealt with in the second volume.

Arthur Young's Travels in France, during the Years 1787, 1788, 1789, *with an Introduction, Biographical Sketch, and Notes.* Edited by Miss Betham-Edwards. Fourth Edition, corrected and revised. London: George Bell and Sons, 1892. Pp. lix + 366. *Price* 3*s.* 6*d.*

Arthur Young's *Travels in France* have been much more read and are generally better known than his *Tour in Ireland*, a new edition of which, from the same publishers, we favourably noticed lately (p. 53). That such should be the case is not surprising, as both method and manner are alike more attractive in the present work than in the former, while the author's shrewdness in observation and power in drawing conclusions are alike noticeable in both works. The notes are helpful and generally luminous, and the biographical sketch is concisely put together and feelingly related, giving an excellent picture of the author calmly engaged in pursuit of his inquiries amid the terrors of the French Revolution, as well as of his latter days spent in blindness and deep sorrow. A portrait of Young serves as a frontispiece, and there is a map. The index is excellent. The volume belongs to Bohn's 'Standard Library.'

Some Further Recollections of a Happy Life, selected from the Journals of Marianne North, chiefly between the years 1859 *and* 1869. Edited by her sister, Mrs. John Addington Symonds. London: Macmillan and Co., 1893. Pp. viii + 316. *Price* 8*s.* 6*d. net.*

We have already (vol. viii. p. 340) noticed Miss North's bright and entertaining *Autobiography*, and feel sure the readers of those volumes will not require this one to be pressed on their attention. It is written in the same fluent and fascinating style, describing men and events in so picturesque and lively a way as to enchain the interest. The scenes traversed in this volume are quite different from those in the first two—lying in the Pyrenees and Spain, Switzerland, Italy, the Danube, Smyrna, Athens, the Adriatic coasts, Syria, Egypt, Palestine, Austria and the Dolomite Alps, Sicily, etc. Miss North enjoyed everything, even mishaps, and so made herself happy, and her readers must be apt to catch her spirit in following her narrative, while they will gain solid information from her descriptions.

Un Royaume Polynesien. Iles Hawaï. Par G. Sauvin. Paris: E. Plon, Nourrit et C^ie^, 1893. Pp. 321.

The Hawaiian kingdom and people have reached a crisis in the island history when it would be specially useful to hear the opinion of an impartial and intelligent observer regarding the conditions and the prospects of the national life. Such an

observer M. Sauvin seeks to be. His visit to the archipelago was made before the recent revolution in its affairs, but all the materials of the change were there and visible to the understanding eye. The author went to Honolulu neither as geographer, statistician, nor business man, but as a philosophic traveller anxious to receive into his mind the prevailing impression of things Hawaiian. He confesses that the seductive influences of the clime are not favourable to a contemplative and philosophic mood. But his book is an agreeable mingling of reflection and observation, of description and history. His admiration for the evidences of modern progress by no means blinds him to what is being lost by the disappearance of old customs and legends—by the substitution of the "Anglo-Saxon civilisation" for the "Hawaiian tradition"; and, as a Frenchman, he is perhaps more alive to the darker side of the change than an American or one of our own countrymen would be. M. Sauvin's journeyings included an excursion to the volcano of Kilauea and a visit to the leper settlement on Molikani. A map of the archipelago is attached.

More about the Mongols. By JAMES GILMOUR. London: The Religious Tract Society, 1893. Pp. 320.

As we learn from the title-page, the contents of this book have been selected and arranged from Gilmour's own diaries and papers by Mr. Richard Lovett, the author of *James Gilmour of Mongolia.* James Gilmour's well-known book *Among the Mongols* will ever hold its place as a graphic account of the curious Eastern people in whose midst he laboured as a missionary for twenty-one years. The present work forms in many respects an interesting supplement to the earlier work. Not the least interesting parts are Chapters II. and III., which are largely reproduced from the full diary kept by Gilmour, and give the first impressions of a strange country upon the fresh mind of an observant man. Chapters V. to XI. are reprints of papers originally contributed to the *Chinese Recorder,* and discuss such varied subjects as Mongolian meteorology, camels, ruins, tobacco. Mr. Gilmour was a strenuous anti-tobacconist; and there is no doubt he gives good sound reasons for his faith. The last chapter is a series of object-lessons—some episodes of Mongolian life serving as a basis for spiritual or moral reflection. Every page is of interest; and even the reader who is familiar with Gilmour's own earlier work will gain much new knowledge regarding the Mongolians.

Die Handelspolitik Englands und seiner Kolonien in den letzten Jahrzehnten. Von Dr. CARL JOHANNES FUCHS. Leipzig: Verlag von Duncker und Humblot, 1893. Pp. 358.

The ultimate purpose of this work seems to be to test the effects of Free Trade on the commerce of Great Britain. The author has therefore collected and arranged a vast amount of material, showing the fluctuations in the trade of the British Islands since 1855. To investigate these figures thoroughly would be a work of time, but we may remark that it is in many cases difficult to draw definite conclusions from them, as they represent the values of the exports and imports only. In times of depression the quantity of goods imported or exported often increases considerably, while the money value, owing to lower prices, shows little if any advance. However, probably no one believes that Great Britain now occupies such a pre-eminent position in the commerce of the world as she did some years ago. And that such is the case is shown by tables giving the imports from England, Germany, France, and the United States into various countries of the world, and the exports of the latter to the above-mentioned States, for the periods 1875-77 and 1884-85.

Though these tables are incomplete and embrace short periods, the lesson they teach may be accepted as approximately true. Quoting from *Uebersichten der Weltwirthschaft* by Neumann-Spallart, Dr. Fuchs states that in 1876 Great Britain's share of the world's commerce was 23 per cent., and in 1885 only 19 per cent. Dr. Fuchs does not maintain that this is the result of Free Trade, but more correctly ascribes it to the development of other countries, which, however, he adds, has been fostered by Free Trade in Britain, while the Protectionism of Continental lands has attained its aim of overthrowing the industrial hegemony of England. It is, of course, impossible to discuss such a question adequately in a few lines. The effect of foreign duties on British trade would need investigation, and the peculiar circumstances of the British Isles, with their teeming population and highly developed industries, would have to be considered. Then, again, it may be asked whether, if foreign countries had adopted Free Trade, they would not by this time have acquired a still greater share in international commerce ?

On one point we are quite in accord with Dr. Fuchs, and that is the desirableness of a commercial union with the Colonies, protected by differential tariffs. If some little material loss to Great Britain were the immediate result, it would be only temporary and more than counterbalanced by political advantages. Now is the time to establish this union, for it will soon be too late. It is the policy of the Germans, as Dr. Fuchs points out, to cultivate commercial relations with the British Colonies, and create interests opposed to a plan which would be detrimental to their trade and industry.

Scenerie der Alpen. Von Dr. Eberhard Fraas. With Illustrations in the text, Page Plates, and a Sketch-Map of the Alps. Leipzig : T. O. Weigel Nachfolger, 1892. 8vo. Pp. 325.

The title of this volume is somewhat deceptive. The reader who takes it up expecting to meet with a picturesque description of the salient scenic features of that mountain-land will be more or less disappointed. The book is rather geological than geographical, for it treats of the various rock-systems, their structure and evolution. The author, however, has so dealt with his subject as to make it thoroughly intelligible to the non-specialist. He analyses the architecture of the mountains, and so gives us the key to the origin of the orographical features of the region. The descriptive part of the work is prefaced by a very interesting and clearly written account of the manner in which great mountain-chains have been formed. The reader who fairly grasps the meaning and intent of these opening chapters will find no difficulty in following the author when he comes to describe the mountain architecture displayed by the various geological systems of rocks. He is careful throughout to confine attention to those geological phenomena which have a more or less close connection with the origin of the Alps. But he does not hesitate to present his readers with graphic descriptions of the appearances which the region presented at successive geological periods. The work is illustrated with many admirable sketch-sections and full-page plates exhibiting typical mountain forms, and altogether is an admirable introduction to the study of the geology and orography of the Alps. For those who desire to go deeper into these subjects, copious references to the geological and geographical literature are provided. Dr. Fraas can be congratulated upon having produced an extremely interesting and valuable handbook, which those who know and love the Alps will read with pleasure and profit. It is a work of which we should be glad to see an English translation.

Die Oro- und Hydrographie Sumatra's, nach dem Standpunkte unserer heutigen Kenntnisse. Mit einer Kartenskizze. Inaugural-Dissertation zur Erlangung der philosophischen Doktorwürde an der Georg-Augusts-Universität zu Göttingen. Von JAN FREERK HOEKSTRA, aus Apeldoorn, Niederlande. Groningen, J. B. Wolters, 1893. Pp. 128.

We wonder how long it will be before we in this country study geography with the comprehensive views, yet painstaking regard for details, and with the systematic thoroughness, sense of its dignity, and fulness of knowledge that the science is entitled to crave as its due. It is but yesterday that geography was deemed worthy of a place in—a modest enough place in sooth—and honoured with the official recognition of, the great Universities of England. We have been infinitely richer in travellers and explorers than in patient stay-at-home geographers. Our efforts have been concentrated in the collection and accumulation of geographical knowledge; to others, mostly foreigners, we have left the less exciting tasks of ordering and sifting that knowledge, and building it up into organic wholes. And yet is it not a good thing, and a useful, to sit down and take stock from time to time of what we do know about this and the other part of our geographical domains? The monographs in which this has been done have, however, been mostly published in Germany, where geography occupies amongst the great branches of human knowledge a position much more consonant with its intrinsic importance than with us. Dr. Hoekstra gives us in this book the first systematic attempt at a description of the physical features of the *whole* of the island of Sumatra. After telling us what is known about the island, and who has made it known, and what has been, and is being, done for the mapping of its surface, he presents, first, a general outline of its physical geography, and then goes on to describe it in detail, arranging his work in divisions and subdivisions. To his division of the subject into the two great sections—the western mountains and the eastern plains—nobody can offer the slightest protest, because the logical grouping is dictated by the inexorable law of fact. The way in which he breaks up these great divisions is not however so convincingly self-evident—which indeed Dr. Hoekstra himself acknowledges. But, considering both the novelty and the difficulty of the task, it would be ungracious to lay stress upon this feature; no one will know better than Dr. Hoekstra himself how far it will be necessary or advisable to modify his arrangement as our knowledge of the details of Sumatran geography increases in extent and minuteness. The book bears abundant evidence of extensive research and patient inquiry; a very large proportion of the information has been fished out of periodical publications. This very useful summary of the geography of a little-known part of the world is supplemented by a couple of tables (lists of lakes and heights of mountain peaks) and a very serviceable index.

Text-Book of Comparative Geology. By E. KAYSER, Ph.D., Professor of Geology in the University of Marburg. Translated and Edited by PHILIP LAKE, M.A., F.G.S. London: Swan Sonnenschein and Co., 1893. 8vo. Pp. 426.

The object of this work is to afford help to geologists who are desirous of acquiring a broader grasp of the bearings of their science than can be obtained when their studies are limited to the rocks of one country alone. It is obvious, indeed, that an investigator in the department of historical geology cannot have too broad a knowledge of his subject. By confining his attention to the rock-systems of a limited area, he may doubtless exhaust the evidence, and yet fail to appreciate its full meaning. But by comparing his results with those obtained in other countries, he will hardly fail to meet with new lights and fresh suggestions, which may lead

him to correct, to modify, or to extend, his views. It is by this comparative method of study that all the more striking generalisations of geology have been arrived at. Dr. Kayser's work was of course intended primarily for use in Germany, and the rock-systems of that country are, therefore, much more fully described than those of other regions. Nevertheless, the space devoted to the discussion of these last is much larger than in the ordinary text-books of general geology, and in the present translation the portions descriptive of extra-German countries have received very considerable additions. In a work of this kind it would be easy to point out sins of omission and commission. Probably no geologist, however great his knowledge and judgment, could produce a volume of comparative geology to which some exception might not be taken. Certainly this English edition of Dr. Kayser's text-book does not realize our conception of what such a text-book would be. Nor, if an ideal book of the kind could be produced, would it alone serve the purpose of the geological investigator who should be desirous of comparing his own results with those arrived at in other lands. For this purpose he would have to visit those lands himself, and to study the works of the geologists who have described them. But for students who are just beginning geological investigation the present treatise will be very helpful, while the references to original sources of information (which might have been more copious) will be useful when he is desirous of digging deeper into his subject.

An Elementary Handbook of Geology. By A. J. Jukes-Browne, B.A., F.G.S., H.M. Geol. Survey. "Library of Popular Science." London: Whittaker and Co., 1893. Pp. ix+248.

Mr. Jukes-Browne's latest book on Geology is put forward avowedly as a popular introduction to the science, and is, like all the books he has previously written, excellent in its way in many respects. Perhaps it is from the very nature of the case that no writer, however able, has yet been able to produce a good popular book on geology without committing some errors and exhibiting shortcomings to a greater or a lesser extent. It is perhaps hardly to be wondered at that it is in connection with Scottish petrography and stratigraphical geology that most of them occur. One or two of these may be noticed here. Pegmatite (p. 62) is not a mere variety of granite: a very brief acquaintance with the geology of the north-west of Scotland suffices to prove that the two rocks are essentially different in structure, mineral constitution, and mode of origin. Tonalite (p. 63) is anything but rare—indeed, most of the Scottish rocks referred to diorite contain both quartz and biotite. His distinction between the (holocrystalline and ophitic) dolerites and the (hemicrystalline) basalts is not correctly stated. Mica-schist and gneiss, again, are incorrectly defined.

Students will be considerably puzzled, also, by finding all the Proterozoic rocks (Cambrian, Ordovician, and Silurian) misprinted as if they were classed under the heading of Archæan (pp. 165-177). The author is assuredly wrong in classing the Scottish Middle Old Red Sandstone along with the true Lower Old Red of Lanarkshire, etc. as one formation, seeing that the two are separated from each other by one of the most extensive unconformities known in the whole geological series. One is tempted also to inquire whether Mr. Jukes-Browne has himself seen marine fossils of Carboniferous species low down in the Upper Old Red Sandstone? Lastly, it is not correct to describe the Lower Carboniferous rocks of Scotland as being essentially of fresh-water origin. Fluvio-marine they may be, but assuredly not of fresh-water origin. The matter is most logically arranged and the book well got up; and if we disregard such shortcomings as those referred

to, which are unavoidable in a compilation avowedly put forth as a popular handbook, we may recommend it to every student who is desirous of learning something of the broader features of geology without caring to work through any of the numerous larger modern treatises on that science.

Advanced Physiography. By Richard A. Gregory and J. C. Christie, F.G.S. With numerous Original Illustrations. London : Joseph Hughes and Co., 1893. Pp. 280.

The *Advanced Physiography* of Messrs. Gregory and Christie is an admirable book—one of the best we have seen on the subject. The conception is good, the elaboration is skilful and practical, and the illustrations are first-rate. The book is a sequel to Mr. Gregory's *Elementary Physiography*, which has an excellent reputation among teachers. It contains chapters on The Principles of Light, Astronomical Instruments and their Use, The Solar System, The Dimensions of the Solar System, Motion and Mass, The Moon's Motions and Consequent Phenomena, Action of the Sun, Moon, and Planets upon the Earth and its Orbit, The Sun and Moon, Planets and Satellites, Celestial Chemistry, Comets and Meteorites, Stars and Nebulæ. For these chapters, which are almost wholly astronomical, Mr. Gregory is responsible. The last three chapters, which deal with moot questions in geology, are contributed by Mr. Christie. They deal with The Earth as a Cooling Globe, The Interior of the Earth, and Kant's Hypothesis. Though mainly speculative, these discussions are extremely interesting. It will be seen that, in its leading lines, the book is well adapted to the syllabus of the Science and Art Department. The style of exposition is characterised by lucidity and completeness, as examples of which reference may be made to the explanation of parallax and its uses (pp. 72-82), and of the precession of the equinoxes (pp. 136-140). To each chapter there are appended examination questions, many of which are taken from the Examination Papers of the Department in successive years.

La France et ses Colonies. Par E. Levasseur. Vol. iii. New Edition, entirely Revised. 1893. Paris : Librairie Charles Delagrave. Pp. 371. Appendices and Indexes.

In vol. vii. p. 396 we favourably noticed M. Lavasseur's thorough work in his first two volumes, and the third and concluding part of his book shows the same research and thorough treatment. It deals with the geological and meteorological conditions of Algiers, Tunis, and all the other French colonies. Apart from this, the agriculture, industries, imports and exports, of the various regions are detailed at length, the commercial statistics being reduced in many instances to graphic charts. A complete alphabetical index to the three volumes is included. The work is well up to date, and the author must be congratulated upon the successful conclusion of his labours.

The Soil in Relation to Health. By H. A. Miers and R. Crosskey. Pp. 130. Index and Illustrations. London : Macmillan and Co., 1893.

The authors of this admirable little book have endeavoured to combine the information contained in large works of geology and hygiene, so far as they concern sanitary science. They have confined the book within a small compass ; but notwithstanding this, have produced a readable, well-balanced and exceedingly useful manual, which will be of use not only to medical men and sanitarians, but can be recommended to any intelligent householder, as it will tend to put an end to many popular delusions which still cling even to educated minds with reference to soil in relation to health. A brief account is given of the origin of rocks and soils ;

then an account of *humus* and the micro-organisms it contains, having special reference to various diseases connected with the soil; next the distribution of water in the soil is considered in its relation to disease, and this chapter is followed by one of great importance on water and its constituents, including remarks upon diseases associated with drinking-water. It is often thought that ground-air is of little importance, but in Chapter v. on the soil in its relation to air, the subject is clearly discussed. We do not quite agree with the author's final chapter, at least with that part of it dealing with Mr. Haviland's maps, although it is true that we should beware of interpreting any map showing the geographical distribution of disease as solely based upon geological data.

Pinetum Danicum. Conifers collected and observed by Professor Carl Hansen. Notes sent to the Conifer Conference held at Chiswick, October 1891. [Reprinted from the *Journal of the Horticultural Society*, vol. xiv.—*Conifer Conference Report.*] London: Spottiswoode and Co., 1892. Pp. 224.

During the last twelve years the Professor has planted and had under observation all the species mentioned in his book; he has now grown more than 900 distinct forms of conifers, which he has arranged on the ground in geographical order, instead of following the more common method of arrangement according to systematic classification.

In dealing with each species, the author commences by enumerating the best-known writers who have previously described it; he then gives its *habitat* and a note containing a large amount of most valuable information regarding the growth of the tree, quality of its timber, etc. The work, which represents a vast amount of labour and research, forms a most valuable book of reference.

History of British Guiana. Vol. ii. By James Rodway, F.L.S. Georgetown, Demerara: J. Thomson, 1893. Pp. 308. *Price* $3.

In this volume Mr. Rodway brings down his admirable history to 1833, and it is gratifying to learn from the statistics he produces that, although founded by the Dutch, "the development of the colony was, in a far greater measure than is usually thought, due to British energy." . . . "Unlike the plodding Dutchman, whose motto might be *festina lente*, the English planter drove his overseers, these pricked up the drivers, who in their turn hurried on the slaves, until things became very lively for those who could stand the strain."

As a specimen of Demerara press-work the volume is a very creditable one, and we trust that the third and concluding volume will contain a good map and index. Perhaps by that time the settlement of the boundaries of British Guiana with Brazil and Venezuela will enable a complete map of the colony to be made.

Handbook of British Guiana. By James Rodway, F.L.S. Georgetown, 1893. Pp. 93.

This ably written and excellently illustrated handbook (printed in Boston, U.S.A.) is published by the "Columbian Exposition Literary Committee of the Royal Agricultural and Commercial Society." The handbook is a model one, and gives every information regarding British Guiana, concluding with the remark: "The colony wants settlers—energetic and industrious people with some capital, prepared to 'rough it' a little at first in view of a future homestead, where all the necessaries of life and many of its luxuries will be at their command. Government land can be bought at a dollar an acre, and the properties of private persons often for considerably less."

Tenting on the Plains, or General Custer in Kansas and Texas. By Elizabeth B. Custer. London: Cassell and Co., 1893. Pp. x+403.

After the Confederate War, General Custer was sent with a detachment of cavalry to try and restore order in Texas, which was kept in a state of ferment by bandits and desperadoes of every sort, who made the borderland between Mexico and the States the scene of their lawless doings. The authoress gives a graphic description of the various marches and camps, interspersed with characteristic incidents in the daily life of the gallant soldier whose memory it is her delight to honour. The book first appeared in 1888, and we find no intimation that this is a second edition.

American Irrigation Engineering. A Paper read before the American Society of Civil Engineers by Herbert M. Wilson, M.Am.Soc.C.E. With Discussion. Pp. 161 to 222. Illustrated.

The author states that before the year 1882 there can scarcely be said to have been constructed in American a single irrigation work designed on sound engineering principles. If this be so, the development of the last ten or eleven years must have been marvellously rapid, for the American works are now probably on a larger scale than those of any other country but India. A great outcry was at first raised regarding the efflorescence of alkaline salts and the production of fevers due to irrigation; but Mr. Wilson claims that these evils have now been reduced to a minimum. The question of securing an uniform and correct standard of water measurement still awaits solution. There are many photographs, the most remarkable being that of the high-trestle canal on the San Diego, in California, which is 1794 feet in length and at least 60 feet high. The pamphlet will be found most interesting by irrigation engineers in all parts of the world.

Gazetteer of the Gurdaspur District, 1891-92. *Rs.* 3/14.—*Gazetteer of the Hissar District*, 1892. *Rs.* 3/12.—*Gazetteer of the Ferozepore District*, 1888-89. *Rs.* 2.—*Gazetteer of the Karnal District*, 1890. *Rs.* 2/8.—*Gazetteer of the Ambala District*, 1892-93. *Rs.* 2/8. Compiled and Published under the authority of the Punjab Government.

These publications are not quite what is generally understood by the name "Gazetteers"; they are rather short district manuals, containing information on the history, inhabitants, tribes, social and religious life, tenures, productions, administration, etc., of the district, with numerous statistical tables relating thereto. Those above named are revised editions by Government officers who have had experience of the different districts. It is not characteristic either of the Panjab or Madras district volumes to afford much of the information proper to gazetteers in Europe. Much depends on the authors' tastes and time, but it is rare to find much detail respecting the towns and villages of a district: even a list of them, with their positions and populations, which might be compiled from the census records and Post Office lists, is perhaps not to be found for any single district.

Spellings still vary: here we have Ambala and Karnal, and most of the places mentioned in the volumes relating to these districts, spelt as transliterated from the phonetic vernacular; but "Ferozepore" is misspelt, as it is mispronounced by Europeans, though most other names are given with commendable consistency.

A. Hartleben's Statistische Tabelle über alle Staaten der Erde. Wien, Pest, Leipzig: A. Hartleben's Verlag, 1893. *Price* 50 *Pf.*

We have here a useful table for hanging on the study wall. It contains statistics of area, population, finance, trade, shipping, railways, etc. etc. There

must surely be some error in the number given as the population of London, viz. 5,656,909. According to the census of 1891, from which the populations of other towns in the kingdom seem to be taken, it was 5,633,332.

Guide to Ben Nevis. With an Account of the Foundation and Work of the Meteorological Observatory. Edinburgh and Glasgow: John Menzies & Co. N.D. Pp. vi. + 69. *Price* 1*s.*

A guide likely to prove of use to the visitor to Ben Nevis, and certain to interest all who have a liking for meteorological research. The descriptions of life in the Observatory, of the results obtained, and of the instruments in use, are graphic and interesting in a high degree. The volume is illustrated by several photographic reproductions, and by sketches by Sir George Reid and Sir Archibald Geikie, accompanied by an excellent orographical map by Messrs. Bartholomew. The tabulated lists of high-level meteorological stations throughout the world, and of the highest mountain-peaks in Great Britain and Ireland, are features of considerable utility. The whole get-up of the little book is excellent in every way.

NEW MAPS.

WORLD.

THE WORLD, on Mercator's Projection.

W. & A. K. Johnston, Edinburgh and London.

The map, which is mounted on a roller, is accompanied by a handbook giving notes on the construction of the map, the mariner's compass, latitude and longitude, winds, currents, tides, sea-ports, ocean-routes, and on the foreign and colonial possessions of Great Britain. We notice some discrepancies, *e.g.* the mariner's compass is not "figured on the map," neither do we find on it the table showing "the difference of time" between various places. The notes on British India require revision.

OZEANEN, Die Jahrestemperaturen der Lufttemperatur über den —— und den Binnenmeeren in ihren Abweichungen von der Formel $\theta = \text{I-}30°$ C. Von Dr. W. Zenker. *Petermann's Geographische Mitteilungen, Jahrgang* 1893, *Tafel* 4.

BRITISH ISLES.

LONDON TO EDINBURGH, The Great North Road and East Coast Route Map from ——. By H. R. G. Inglis.

London, 1893 : *Gall and Inglis.*

A handy little volume for a cyclist's pocket, arranged in an ingenious manner, so that any part of the route can be consulted without spreading out a large sheet. There are various printed statements regarding mileages and distances, which add to the usefulness of the book.

LAKE DISTRICT, Reduced Ordnance Survey Map of the ——. By John Bartholomew, F.R.G.S. Scale 3 miles to 1 inch. *Price* 1*s. cloth.*

Keswick, Grasmere, etc., Environs of ——. Scale 1 mile to 1 inch. *Price* 1*s. paper;* 2*s. cloth.* *London: W. H. Smith and Sons.*

These are two very useful maps for the ordinary tourist and for the scientific traveller. Altitudes are clearly distinguished by colour and contour lines, and all paths and roads are distinctly marked.

NOTTINGHAM, New Plan of ——, from Ordnance and Actual Surveys. *Price* 1*s. paper* ; 2*s. cloth.* *London* : *W. H. Smith and Sons.*

A clearly printed map by Messrs. Bartholomew, with buildings, water, roads, etc. indicated by different colouring. Visitors to Nottingham on the occasion of the meeting of the British Association will find it a useful pocket companion.

BOURNEMOUTH, Plan of ——, with Environs.

London: W. H. Smith and Sons.

This is a new and revised edition of Messrs. Bartholomew's map. The plan of the town and the map of the environs are conveniently placed on the same sheet. The latter extends from Winchester and Newport on the west to Dorchester and Weymouth on the east.

SCOTLAND, W. & A. K. Johnston's Guide Map of ——, for Tourists. *Price* 1*s.*

London: Adam and Charles Black.

On this map railways, coach routes, and steamer routes are distinctly marked, and under the name of each town the chief objects of interest in the neighbourhood, or the historical event for which it is noted, is given.

PLAN OF EDINBURGH, LEITH, PORTOBELLO, AND ENVIRONS, constructed from the latest surveys, with additions by the local surveyors of these towns. *Scale* 6″ *to a mile.* *W. & A. K. Johnston, Edinburgh and London*, 1893.

We welcome this new edition of a well-known and most excellent map, which is accompanied by an index of 12 pp. The list of "Public Buildings" might perhaps be made to include the Rooms of a few more of the scientific and other societies.

STIRLINGSHIRE, Edgar's Map of ——, 1745. *Reprinted*, 1892, *by R. S. Shearer and Son, Stirling.*

The publishers deserve all praise for the enterprise they have exhibited in reprinting old and rare books and maps connected with the county of Stirling. The latest of these reproductions is Edgar's map, well known by name, but now seldom to be met with. It is a most interesting chart, and may with advantage be compared with the map in Blaeu's Atlas of 1662, the comparison bringing out the changes of eighty-three years. It is strongly mounted and handsomely bound.

NORTH AMERICA.

UNITED STATES, Geological Survey of the ——. J. Powell, director.

General Maps. Scale, 1 : 62,500.

Connecticut : Gilead, Guilford, Middletown, New Haven, Norwich, Saybrook, Woodstock.

Louisiana : Creole, Donaldsonville, Gibson, Houma, Mt. Airy, Pt. à la Hache, West Delta.

New York : Albany, West Point.

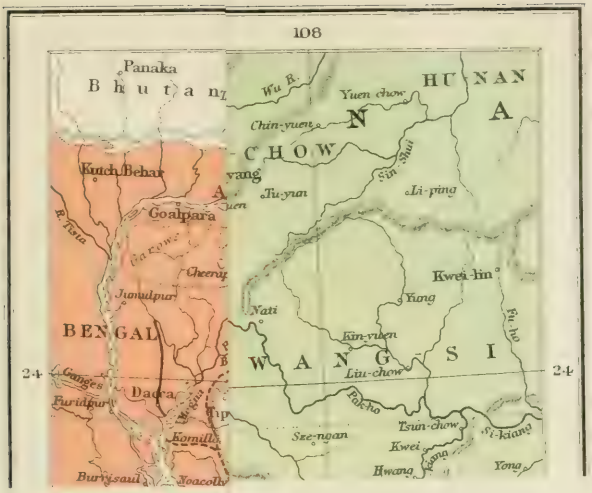
Tennessee : Sewanee.

GUATEMALA, Karte der Verbreitung der Sprachen in—ums Jahr 1892. Von Dr. K. Sapper. Massstab 1:2,000,000.

Petermann's Geographische Mitteilungen, Jahrgang 1893, *Tafel* 1.

NICARAGUA, Die Goldminen-Distrikte in den Flussgebieten Prinzapolca und Cuculaia im östlichen ——. Auf Befehl Sr. Exc. des Präsidenten Dr. Roberto Sacasa aufgenommen und gezeichnet von Dr. Bruno Mierisch. Massstab 1:700,000.

Petermann's Geographische Mitteilungen, Jahrgang 1893, *Tafel* 3.


Panaka
Bhutan
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Yuen chow
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Furidpur
Dacca
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Tsun-chow
Si-kiang
Sze-ngan
Kwei
Hwang
Yong
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Joacolly

MAP ILLUSTRATING THE SIAMESE FRONTIER CHANGES, 1893.

THE SCOTTISH GEOGRAPHICAL MAGAZINE.

ADDRESS TO THE GEOGRAPHICAL SECTION OF THE BRITISH ASSOCIATION,

NOTTINGHAM, 1893.

By HENRY SEEBOHM, Sec.R.G.S., F.L.S., F.Z.S.

President of the Section.

(With a Map.)

GEOGRAPHY, the child of Mathematics and Astronomy, stands in the relation of mother to half a dozen other sciences, which have long ago left the parental roof to establish sections of their own. Like every other science, geography is so closely connected with, and dependent on, its allied sciences, that it is impossible to treat of the one without invading the province of the others. No one supposes that the making of maps is the whole duty of the geographer. The accurate delineation of the trend of coast-lines, the courses of rivers, the heights of mountains, the depths of seas, or the position of towns, is only the skeleton which underlies the real science of geography.

The study of geography may be divided into various sections, but it must always be remembered that they dovetail into each other, as well as into the allied sciences, to such an extent that no hard-and-fast line can be drawn between them. The object of dividing so comprehensive a section as that of geography into sub-sections is more practical than scientific. The classification of facts is an important aid to memory, and introduces order into what might otherwise seem to be a chaos of knowledge.

The foundation of all geography is EXPLORATION; but before the traveller can do good geographical work he must acquire the necessary knowledge embraced in the science of CARTOGRAPHY. This includes a practical acquaintance with the various instruments used in making a

survey, the necessary mathematical and astronomical knowledge required for their use, and a familiarity with the accepted mode of expressing the geographical facts that may be acquired on a chart or map. Exploration may then be undertaken with some chance of ultimate success, but the object of exploration must be something more than the filling up of blanks in our maps. Many other subjects must receive attention, subjects which are collectively included in the term physical geography, but which require treatment under different heads. Of these the most obvious is the geographical distribution of light and heat, as well as the more fitful alternations of wind and rain with calm and drought; in other words, the numerous causes which combine to produce climate. Meteorology or CLIMATOLOGY, the geography of the air, is a most important branch of geography in general; and when we come to inquire into the changes which have taken place in the climate of different parts of the earth's surface, especially those which have affected the Polar Basin, we enter upon a subject which has claimed a large share of the attention of geologists, who have also made a profound study of the geographical distribution of the various kinds of rock which are found on the crust of the earth. Another sub-section of great importance is the geographical distribution of organic life. The geographical ranges of the species and genera, both of plants and animals, have become a subject of vastly increased importance since so much attention has been directed to the theory of evolution; and the paramount importance of the human race is so great that ethnological geography may fairly claim to be treated as a sub-section apart from the study of the rest of the fauna of a country. Inasmuch as a map with the towns left out is only half a map, the geographer cannot afford to neglect the races of men with which he comes in contact, or the remains (architectural or otherwise) which existing nations have produced or past races have left behind them.

I propose on the present occasion to elaborate these subjects at greater detail, and, with your permission, to take the Polar Basin as an example.

There is only one Polar Basin; the relative distribution of land and water and the geographical distribution of light and heat in the Arctic region is absolutely unique. In no other part of the world is a similar climate to be found. The distribution of land and water round the South Pole is almost the converse of that round the North Pole. In the one we have a mountain of snow and ice covering—it may be a continent, it may be an archipelago, but in any case a lofty mass of congealed water surrounded by an ocean stretching away with very little interruption from the land to the confines of the tropics. In the other we have a basin of water surrounding a comparatively flat plain of pack ice, some of which is probably permanent, but most of which is driven hither and thither in summer by winds and currents, and is walled in by continental and island barriers broken only by the narrow outlets of Bering Strait and Baffin's Bay and the broader gulf which leads to the Atlantic Ocean, and even that interrupted by Iceland, Spitzbergen, and Franz Josef Land. When we further remember that this gulf is constantly conveying the hot water of the tropics to the Arctic

Ocean, and that every summer gigantic rivers are pouring volumes of comparatively warm water into this ocean, we cannot but admit that the climatic conditions near the two poles differ widely from each other.

In looking at a map of the Polar Basin one cannot help remarking the curious fact that the North Pole is so very nearly central, and a glance at the southern hemisphere also shows a rough sort of symmetry in the distribution of land and water round the South Pole. It is a curious coincidence if this be only accident.

The history of the

EXPLORATION

of the Polar Basin is a very long and a very tragic story. Much has been done, but much remains to be done. The unexplored regions of the Polar Basin may be estimated at a million square miles. No part of the world presents greater difficulties to the explorer. Many brave men have perished in the enterprise, and more have only just succeeded in passing through the ordeal of hunger and cold with their lives. For the most part the heroic endurance of the tortures of famine has shown a marvel of discipline, though occasionally the commanders of the expeditions have had to enforce obedience to the verge of cruelty, both in the case of men and of dogs. There are, indeed, a few ghastly stories of mutinous men who have been shot, and of cases where it has been found necessary to resort to human food to save the lives of the survivors, but the records of Arctic exploration are records of which any nation might be proud.

Of recent years there has been but little done to explore the unknown parts of the Polar Basin. Adventurous journeys in Central Africa and Central Asia have somewhat eclipsed the exploration of the Arctic regions. Two visits to Greenland cannot, however, be entirely passed by in silence. In the summer of last year an expedition went to the north of Greenland under the command of Lieutenant Peary, succeeded in reaching latitude 82°, and added material evidence to prove that Greenland is an island. The expedition sailed on June 6, 1891, steamed up Baffin's Bay and Smith's Sound, and on July 25 dismissed the ship and established themselves in winter quarters in M'Cormick Bay, on the north side of Murchison Sound, in latitude 78°. They laid in a stock of game for the winter, guillemots and reindeer. A most interesting proof of the successful organisation of the expedition is the fact that Mrs. Peary was one of the party, and was able to accompany her husband on a sledge trip which started on the 18th of the following April.

It took the party a week in their dog sledges to round Inglefield Gulf, during which they discovered thirty glaciers, ten of them of the first magnitude. During the next three months they explored the north coast of Greenland, as far east as longitude 34° W., when a great bay was reached which they named Independence Bay, as they discovered it on July 4. The northern shore of this bay was free from snow and ice. On August 6 they regained their winter quarters in M'Cormick Bay. On the 8th the steamer arrived, and on the 24th they started for home, reaching Philadelphia on September 23. During the sledge journey they travelled for a fortnight at an average elevation of 8000 feet above the

sea. Besides their important additions to the map of Greenland, the suggestive fact that the thermometer can rise to 41° F., and that torrents of rain can fall in the middle of February as far north as latitude 78°, must be regarded as a valuable discovery.

It was hardly to be expected that so successful a journey should not be followed by a second attempt in order to follow up the discoveries of the first. Peary has sailed to the north of Greenland with a more carefully organised staff for a longer expedition, and has reached his winter quarters. They expect to be absent two years or more. It has been arranged to spend the coming winter not far from their previous quarters. In March they hope to start for Independence Bay, which was discovered on the previous expedition, and there the party will divide, with the object of completing the survey of the coast line of Greenland by reaching Cape Bismarck if possible, and at the same time to explore the northern coast line of Independence Bay, hoping that it may land them farther north than the highest point yet reached by any Arctic traveller.

In the summer of 1888 Dr. Nansen was bold enough to cross the continent of Greenland about latitude 64°, reaching an altitude of 9000 feet, and he told his story to this Section in his own simple words on his return. The distance across was about ten degrees, and the highest point was about one-third of the way across from the east coast. If the scientific results were necessarily somewhat meagre, Dr. Nansen established a reputation for bravery and physical endurance which he hopes to increase by an attempt to reach the North Pole. The *Fram* has already started from Hammerfest, and was telegraphed a few weeks ago from the east coast of Norway. The intention is to enter the Kara Sea and to push northwards and eastwards, hoping that the warm currents caused by the great Siberian rivers will enable them to get well into the ice before winter begins. Once frozen into the pack ice, Nansen hopes to be carried by the currents somewhere near the North Pole, and, after drifting for two or three years, he hopes finally to emerge from his ice prison somewhere on the east coast of Greenland. Foolhardy as the expedition appears, it is nevertheless planned with great skill, and its chances of success are supposed to be based upon a sufficiently accurate knowledge of the ocean currents of the Polar Basin.

These currents, so far as they are known, are very interesting. The Mackenzie and the great Siberian rivers flow into the Polar Basin, and the current through Bering Strait is supposed to do the same ; but both these sources of supply can only be regarded as of minor importance. Between Spitzbergen and Finmark, however, the Gulf Stream, 300 or 400 miles wide, enters the Polar Basin. To compensate for these inward currents there are two outward currents, one on each side of Greenland, which, coming from the centre of cold, do their best to intensify the rigours of that mountainous island.

Nansen hopes that the current which carried the *Jeannette* from Herald Island, north of Bering Strait, in a north-westerly direction, for 500 or 600 miles, is the same current that flows down the east coast of Greenland, and he bases his hopes upon three facts. First, that many articles

from the wreck of the *Jeannette* were found on an ice floe off the south coast of Greenland three years afterwards; second, that a harpoon-thrower of a pattern unknown except in Alaska was picked up on the south-west coast of Greenland: and, third, that drift-wood supposed to be of Siberian origin is stranded regularly in considerable quantity on the coasts of Greenland. The Norwegian at Hammerfest, about latitude 70°, is dependent for his firewood upon the Gulf Stream, which brings him an ample supply from the Gulf of Mexico, whilst the Eskimo on the Greenland coast, in the same latitude, trusts to a current from the opposite direction to bring him his necessary store of wood from the Siberian forests.

We can only hope that Nansen will find the currents as favourable to his needs, and that so much bravery may be supported by good luck.

By no means the least important physical feature of the Polar Basin is its gigantic

RIVER SYSTEMS.

The rivers which flow into the Arctic Ocean are some of them amongst the greatest in the world.

Some idea of the relative sizes of the drainage areas of a few of the best-known rivers may be learnt from the following table, in which the Thames, with a drainage area of 6000 square miles, is the unit:

9	Thames	equal	1 Elbe (54,000).
2	Elbes	,,	1 Pechora (108,000).
2½	Pechoras	,,	1 Danube (270,000).
2	Danubes	,,	1 Mackenzie (540,000).
2	Mackenzies	,,	1 Yenisei (1,080,000).
2	Yeniseis	,,	1 Amazon (2,160,000).

Perhaps a more scientific classification of rivers would be to call those with a drainage area between 2,560,000 and 1,280,000 square miles rivers of the first magnitude, a category which contains the Amazon alone. There are ten rivers of the second magnitude, with drainage areas between 1,280,000 and 640,000 square miles (Ob, Congo, Mississippi, La Plata, Yenisei, Nile, Lena, Niger, Amur, Yangtse). There are twelve rivers of the third magnitude, with drainage areas between 640,000 and 320,000 square miles (Mackenzie, Volga, Murray, Zambesi, Saskatchewan, Ganges, St. Lawrence, Orange, Orinoco, Hoang Ho, Indus, and Bramaputra). There are more than a dozen rivers of the fourth magnitude, with drainage areas between 320,000 and 160,000 square miles, but none of them empties itself into the Arctic Ocean. They include the Danube, Euphrates, and several of the African and South American rivers. Of the numerous rivers which are of the fifth magnitude, with drainage areas between 160,000 and 80,000 square miles, the Pechora belongs to the Polar Basin. The number of rivers of lesser magnitude is legion, and it is only necessary to quote one of each as an example.

6th	magnitude	(80,000 to 40,000), Rhine.
7th	,,	(40,000 to 20,000), Rhone.
8th	,,	(20,000 to 10,000), Garonne.
9th	,,	(10,000 to 5,000), Thames.

There is nothing that makes a greater impression upon the Arctic traveller than the enormous width of the rivers. The Pechora is only a river of the fifth magnitude, but it is more than a mile wide for several hundred miles of its course. The Yenisei is more than three miles wide for at least a thousand miles, and a mile wide for nearly another thousand. Whymper describes the Yukon as varying from one to four miles in width for three or four hundred miles of its length. The Mackenzie is described as averaging a mile in width for more than a thousand miles, with occasional expansions for long distances to twice that size.

The drainage area does not measure the size of the Arctic rivers at all adequately. Though the rainfall of many of them is comparatively small, the size of the rivers is relatively very large, owing to the sudden melting of the winter's accumulation of snow, which causes an annual flood of great magnitude, like the rising of the Nile. Even on the Amur in Eastern Siberia, and on the Yukon in Alaska, the annual flood is important enough, but on the rivers which flow north into the Polar Sea the damming up of the mouths by the accumulations of ice produces an annual deluge, frequently extending over thousands of square miles, a catastrophe the effects of which have been much underrated and never adequately described.

If we assume that the unknown regions are principally sea, then the Polar Basin, including the area drained by all rivers flowing into the Arctic Sea, may be roughly estimated to contain about 14,000,000 square miles, of which half is land and half water. In the coldest part of the basin the land is either glacier or tundra, and in the warmer parts it is either forest or steppe.

Greenland, the home of the

GLACIER

and the mother of the icebergs of the Northern Atlantic, rises 9000 or 10,000 feet above sea-level, whilst the sea between that lofty plateau and Scandinavia is the deepest known in the Polar Basin, though it is separated from the rest of the Atlantic by a broad belt or submarine plateau connecting Greenland across Iceland and the Faröes with the British Islands and Europe. Iceland, Spitzbergen, and Novaia-Zemlia, the latter a continuation of the Urals, are all mountainous and full of glaciers. The glaciers of Southern Alaska are some of the largest in the world. The glaciers and the icebergs have a literature of their own, and we must pass them by to say a word or two about

THE TUNDRA.

The Arctic Sea, which lies at the bottom of the Polar Basin, is fringed with a belt of bare country, sometimes steep and rocky, descending in more or less abrupt cliffs and piles of precipices to the sea, but more often sloping gently down in mud banks and sand hills representing the accumulated spoils of countless ages of annual floods, which tear up the banks of the rivers, and deposit shoals of detritus at their mouths, compelling them to make deltas in their efforts to force a passage to the sea. In Norway this belt of bare country is called the Fjeld, in Russia it

is known as the Tundra, and in America its technical name is the Barren Grounds. In the language of science it is the country beyond the limit of forest growth.

In exposed situations, especially in the higher latitudes, the tundra does really merit its American name of Barren Ground, being little else than gravel beds interspersed with bare patches of peat or clay, and with scarcely a rush or a sedge to break the monotony. In Siberia, at least, this is very exceptional. By far the greater part of the tundra, both east and west of the Ural Mountains, is a gently undulating plain, full of lakes, rivers, swamps, and bogs. The lakes are diversified with patches of green water plants, amongst which ducks and swans float and dive; the little rivers flow between banks of rush and sedge; the swamps are masses of tall rushes and sedges of various species, where phalaropes and ruffs breed, and the bogs are brilliant with the white fluffy seeds of the cotton grass. The groundwork of all this variegated scenery is more beautiful and varied still—lichens and moss of almost every conceivable colour, from the cream-coloured reindeer moss to the scarlet-cupped trumpet moss, interspersed with a brilliant alpine flora, gentians, anemones, saxifrages, and hundreds of plants, each a picture in itself, the tall aconites, both the blue and yellow species, the beautiful cloudberry, with its gay white blossom and amber fruit, the fragrant *Ledum palustre* and the delicate pink *Andromeda polifolia*. In the sheltered valleys and deep watercourses a few stunted birches, and sometimes large patches of willow scrub, survive the long severe winter, and serve as cover for willow grouse or ptarmigan. The Lapland bunting and red-throated pipit are everywhere to be seen, and certain favoured places are the breeding grounds of plovers and sandpipers of many species. So far from meriting the name of Barren Ground, the tundra is for the most part a veritable paradise in summer. But it has one almost fatal drawback—it swarms with millions of mosquitoes.

The tundra melts away insensibly into the

FOREST,

but isolated trees are rare, and in Siberia there is an absence of young wood on the confines of the tundra. The limit of forest growth appears to be retiring southward, if we may judge from the number of dead and dying stumps; but this may be a temporary or local variation caused by exceptionally severe winters. The limit of forest growth does not coincide with the isotherms of mean annual temperature, nor with the mean temperature for January nearly so closely as it does with the mean temperature for July. It may be said to approximate very nearly to the July isotherm of 53° F. We may therefore assume that a six-foot blanket of snow prevents the winter frosts from killing the trees so long as they can be revivified by a couple of months of summer heat above 50° F.

The limit of forest growth is thus directly determined by geographical causes. In Alaska and in the Mackenzie Basin it extends about 300 miles above the Arctic Circle, but in Eastern Canada the depression of Hudson's Bay acts as a vast ice-house, and the forest line falls 500 miles below the Arctic circle, whilst on the east coast of Labrador the Arctic

current from Baffin's Bay sends it down nearly as far again. On the other side of the Atlantic the limit of forest growth begins on the Norwegian coast on the Arctic Circle, gradually rises until it reaches 200 miles farther north in Lapland, is depressed again by the ice-house of the White Sea, but has recovered its position in the valley of the Pechora, which is rather more than maintained until a second vast ice-house, the Sea of Okotsk, combined with Arctic currents, repeats the depression of Labrador in Chuski Land and Kamchatka.

There are no trees on Novaia Zemlia. Two or three species of willow grow there, but they are dwarfs, seldom attaining a height of three inches. Novaia Zemlia enjoys a comparatively mild winter, the mean temperature of January, thanks to the influence of the Gulf Stream, being 15° F. above zero in the south, and only 5° F. below zero in the north. The absence of trees is due to the cold summers, the mean temperature of July not reaching higher than 45° F. in the south, whilst in the north it reaches only 38° F.

The Indians of Canada have discovered that when they want to find water in winter it is most easily reached under thick snow, the thinnest ice on the river or lake being found under the thickest blanket of snow. On the same principle the tree roots defy the severe winters protected by their snow shields, but they must have a certain temperature (above 50° F.) to hold their own in summer.

The influence of the snow blanket is very marked in determining the depths to which the frost penetrates beneath it. Thus we find that a Norwegian writer, alluding to latitude 62°, remarks "that the ground is frozen from one to two and a half feet in winter, but this depends upon how soon the snow falls. Higher up the mountains the ground is scarcely frozen at all, owing to the snow falling sooner, and, in fact, if the snow falls very early lower down, it is scarcely frozen to any depth." Similar facts have been reported from Canada in latitude 53°. "On this prairie land, when there is a good fall of snow when the winter sets in, the frost does not penetrate so deep as when there is no snow till late." Another writer a little farther south, in latitude 51°, says: "I am safe in saying that the frost penetrates here to an average of five feet, except when we have had a great depth of snow in the beginning of winter, in which case it does not penetrate nearly so far."

It is not so easy to explain the boundary line between the forest and the

STEPPE.

There are two great steppe regions in the Polar Basin, one in Asia and the other in America. The great Barabinski steppe in South-west Siberia stretches with but slight interruptions across Southern Russia into Bulgaria. The great prairie region of Minnesota and Manitoba reaches the Mackenzie Basin, and outlying plains are found almost up to the Great Slave Lake. The cause of the treeless condition of the steppes or prairies has given rise to much controversy. My own experience in Siberia convinced me that the forests were rocky, and the steppes covered with a deep layer of loose earth, and I came to the conclusion that on the rocky

ground the roots of the trees were able to establish themselves firmly so as to defy the strongest gales, which tore them up when they were planted in light soil. Other travellers have formed other opinions. Some suppose that the prairies were once covered with trees which have been gradually destroyed by fires. Others suggest that the earth on the treeless plains contains too much salt or too little organic matter to be favourable to the growth of trees. No one, so far as I know, has suggested a climatic explanation of the circumstance. Want of drainage may produce a swamp, and the deficiency of rainfall may cause a desert, both conditions being fatal to forest growth, but no one can mistake either of these treeless districts for a steppe or prairie. The

ANTHROPOLOGY

of the Polar Basin presents many points of interest. On the American coasts of the Arctic Ocean the Eskimo lives a very similar life to the Lapp in Norway and the Samoyede in the tundras of Siberia. These races of men resemble each other very much in their personal appearance, and still more so in their habits. Their straight black hair, with little or no beard, their dark and obliquely-set eyes, their high cheek-bones and flat noses, and their small hands and feet, testify to their Mongoloid origin. They are all indebted to the reindeer for some of their winter dress and for much of their food, and they all have dogs; but the Eskimo travels only with dogs, and the Lapp only with reindeer, whilst the Samoyede uses both dog sledges and reindeer sledges. They all lead a nomadic life, trapping fur-bearing animals in winter and fishing in summer; they resemble each other in many other customs and beliefs, but they are nevertheless supposed to have emigrated to the Arctic regions from independent sources, and many characters in which they resemble each other are supposed to have been independently acquired.

The various races which inhabit the Polar Basin below the limit of forest growth are too numerous to be considered in detail.

THE FAUNA.

Most zoologists divide the Polar Basin into two zoological regions, or, to be strictly accurate, they include the Old World half of the Polar Basin in what they call the Palæarctic region, and the New World half in the Nearctic region; but recent investigations have shown that these divisions are unnatural and cannot be maintained. Some writers unite the two regions together under the name of the Holarctic region, whilst others recognise a circumpolar Arctic region above the limit of forest growth, and unite in a second region the temperate portions of the northern hemisphere. In the opinion of the last-mentioned writers the circumpolar Arctic region differs more from the temperate regions of the northern hemisphere than the American portion of the latter does from the Eurasian portion.

The fact is, that life areas, or zoo-geographical regions, are more or less fanciful generalisations. The geographical distribution of animals, and probably also that of plants, is almost entirely dependent upon two

factors, *climate* and *isolation*, the one playing quite as important a part as the other. The climate varies in respect of rainfall and temperature, and species are isolated from each other by seas and mountain ranges. The geographical facts which govern the zoological provinces consequently range themselves under these four heads. It is at once obvious that the influences which determine the geographical distribution of fishes must be quite different from those which determine the distribution of mammals, since the geographical features which isolate the species in the one case are totally different from those which form impassable barriers in the other. It is equally obvious that the climatic conditions which influence the geographical range of mammals must include the winter cold as well as the summer heat, whilst those which determine the geographical distribution of birds, most of which are migratory in the Arctic regions, is entirely independent of any amount of cold which may descend upon their breeding-grounds during the months which they spend in their tropic or sub-tropic winter quarters.

Hence all attempts to divide the Polar Basin into zoological regions or provinces are futile. Nearly every group of animals has zoological regions of its own, determined by geographical features peculiarly affecting itself, and any generalisations from these different regions can be little more than a curiosity of science. The mean temperature or distribution of heat can be easily ascertained. It is easy to generalise so as to arrive at an average between the summer heat and the winter cold, because they can be both expressed in the same terms. When, however, we seek to generalise upon the distribution of animal or vegetable life, how is it possible to arrive at a mean geographical distribution of animals? How many genera of mollusks are equal to a genus of mammals, or how many butterflies are equal to a bird?

If there be any region of the world with any claim to be a life area, it is that part of the Polar Basin which lies between the July isotherm of 50° or 53° F. and the northern limit of organic life. The former corresponds very nearly with the northern limit of forest growth, and they comprise between them the barren grounds of America and the tundras of Arctic Europe and Siberia.

The fauna and flora of this circumpolar belt is practically homogeneous; many species of both plants and animals range throughout its whole extent. It constitutes a circumpolar Arctic region, and cannot consistently be separated at Bering Strait into two parts of sufficient importance to rank even as sub-regions.

Animals recognise facts, and are governed by them in the extension of their ranges; they care little or nothing about generalisations. The mean temperature of a province is a matter of indifference to some plants and to most animals. The facts which govern their distribution are various, and vary according to the needs of the plant or animal concerned. To a migratory bird the mean annual temperature is a matter of supreme indifference. To a resident bird the question is equally beside the mark. The facts which govern the geographical distribution of birds are the extremes of temperature, not the means. Arctic birds are nearly all migratory. Their distribution during the breeding season depends

primarily on the temperature of July, which must range between 53° and 35° F. It is very important, however, to remember that it is actual temperature that governs them, not isotherms corrected to sea-level. If an Arctic bird can find a correct isotherm below the Arctic Circle by ascending to an elevation of 5000 or 6000 feet above the level of the sea, it avails itself of the opportunity. Thus the region of the Dovrefeld above the limit of forest growth is the breeding place of many absolutely Arctic birds ; but this is not nearly so much the case on the Alps, because the cold nights vary too much from the hot days to come within the range of the birds' breeding grounds. Here, again, the mean daily temperature is of no importance. It is the extreme of cold which is the most potent factor in this case, and no extreme of heat can counterbalance its effect.

In estimating the influence of elevation upon temperature it has been ascertained that it is necessary to deduct about 3° F. for every thousand feet. The

ISOTHERMAL LINES

are very eccentric in the Polar Basin. The mean temperature of summer is quite independent of that of winter. The isothermal lines of July are regulated by geographical causes which do not affect those of December, or operate in a contrary direction. The Gulf Stream raises the mean temperature of Iceland during winter to the highest point which it reaches in the Polar Basin, viz., 30° to 35° F., whilst in summer it prevents it from rising above 45° and 50° F.—a range of only 15°. In the valley of the Lena, in the same latitude, the mean temperature of January is 55° to 50° F. below zero, whilst that of July is 60° to 65° F. above zero—a range of 115°.

The close proximity of the Pacific Ocean has a much less effect on the mean temperature at Bering Strait, which is in the same latitude as the north of Iceland. The mean temperature for January is zero, whilst that for July is 40° F. The mean temperature for January in the same latitude in the valley of the Mackenzie is 25° below zero, whilst that for July is 55° F. In this case the contrast of the ranges is 40 and 80, which compared with 15 and 115 is small, but the geographical conditions are not the same. Bering Sea is so protected by the Aleutian chain of islands that very little of the warm current from Japan reaches the straits. It is deflected southwards, so the Aleutian Islands form a better basis for comparison. Their mean temperature for January is 35° F., whilst that for July is 50° F., precisely the same difference as is found in Iceland.

The influence of geographical causes upon climate being at present so great, it is easy to imagine that changes in the distribution of land and water may have had an equally important influence upon the climate of the Polar Basin during the recent cold age, which geologists call the Pleistocene period. It is impossible for the traveller to overlook the evidences of this so-called Glacial Period in the Polar Basin, and whether we seek an explanation of the geographical phenomena from the astronomer or the geologist, or both, it is impossible to ignore the geographical interest of the subject.

No sciences can be more intimately connected than geography and

GEOLOGY.

A knowledge of geography is absolutely essential to the geologist. To discriminate between one kind of rock and another is a comparatively small part of the work of the geologist. To ascertain the geographical distribution of the various rocks is a study of profound interest. If the geologist owes much to the geographer, the latter is also largely indebted to the labours of the former. The geology of a mountain range or an extended plain is as important to the physical geographer as the knowledge of anatomy is to the figure-painter.

The geology of the Polar Basin is not very accurately known, and the subject is one too vast to be more than mentioned on an occasion like the present; but the evidences of a comparatively recent ice age in Eastern America and Western Europe are too important to be passed by without a word.

In the sub-Arctic regions of the world there is much evidence to show that the climate has in comparatively recent times been Arctic. The present glaciers of Central Europe were once much greater than they are now, and even in the British Islands glaciers existed during what has been called the Ice Age, and the evidence of their existence in the form of rocks, upon which they have left their scratches, and of heaps of stones which they have deposited in their retreat, are so obvious that he who runs may read. Similar evidence of an ice age is found in North America, and to a limited extent in the Himalayas, but in the alluvial plains of Siberia and North Alaska, as might be expected, no trace of an ice age can be found.

Croll's hypothesis that an ice age is produced when the eccentricity of the earth's orbit is unusually great has been generally accepted as the most plausible explanation of the facts. It is assumed that during the months of perihelion evaporation is extreme, and that during the months of aphelion the snowfall is considerably increased. The effect of the last period of high eccentricity is supposed to have been much increased by geographical changes. The elevation of the shallow sea which connects Iceland with Greenland on the one hand, and the south of Norway and the British Islands on the other, would greatly increase the accumulation of snow and ice in those parts of the Polar Basin where evidence of a recent ice age is now to be found; whilst the depression of the lowlands on either side of the Ural Mountains, so as to admit the waters of the Mediterranean through the Black and Caspian Seas, might prevent any glaciation in those parts of the Polar Basin where no evidence of such a condition is now discoverable. But this is a question that must be left to the geologist to decide.

The extreme views of the early advocates of the theory of an ice age have been to a large extent abandoned. No one now believes in the former existence of a Polar ice cap, and possibly when the irresistible force of ice-dammed rivers has been fully realised, the estimated area of glaciation may be considerably reduced. The so-called Great Ice Age may have been a great snow age, with local centres of glaciation on the higher grounds.

The zoological evidence as to the nature, extent, and duration of the Ice Age has never been carefully collected. The attention of zoologists has unfortunately been too exclusively devoted to the almost hopeless task of theorising upon the causes of evolution, instead of patiently cataloguing its effects.

There is a mass of evidence bearing directly upon the recent changes in the climate of the Polar Basin to be found in the study of the present geographical distribution of birds. The absence of certain common British forest birds (some of them of circumpolar range sub-generically, if not specifically) from Ireland and the North of Scotland is strong confirmation of the theory that the latter countries were not very long ago outside the limit of forest growth.

The presence of species belonging to Arctic and sub-Arctic genera on many of the South Pacific Islands is strong evidence that they were compelled to emigrate in search of food by some great catastrophe, such as an abnormally heavy snowfall, and the fact that no island contains more than one species is strong evidence that this great catastrophe has only occurred once in recent times. The occurrence of a well-recognised line of migration from Greenland across Iceland, the Faröes, and the British Islands to Europe is strongly suggestive of a recent elevation of the land where the more shallow sea now extends in this locality. The extraordinary similarity of the fauna and flora of the Arctic regions of the Old and New Worlds can only be found elsewhere in continuous areas, and, had it not been for the unfortunate division of the Arctic region into two halves, Palæarctic and Nearctic, would have attracted much more attention than it has hitherto received.

THE RAINFALL

of the Polar Basin is small compared to that with which we are familiar, but its visible effects are enormous. In Arctic Europe and Siberia it is supposed to average about thirteen inches per annum; in Arctic America not more than nine inches. The secret of its power is that about a third of the rainfall descends in the form of snow, which melts with great suddenness.

The stealthy approach of winter on the confines of the Polar Basin is in strong contrast to the catastrophe which accompanies the sudden onrush of summer. One by one the flowers fade, and go to seed if they have been fortunate enough to attract by their brilliancy a bee or other suitable pollen-bearing visitor. The birds gradually collect into flocks, and prepare to wing their way to southern climes. Strange to say, it is the young birds of each species that set the example. They are not many weeks old. They have no personal experience of migration, but Nature has endowed them with an inherited impulse to leave the land of their birth before their parents. Probably they inherit the impulse to migrate without inheriting any knowledge of where their winter quarters are to be found, and by what route they are to be sought. They are sometimes, if not always, accompanied by one or two adults, it may be barren birds, or birds whose eggs or young have been destroyed, and who may therefore get over their autumn moult earlier than usual, or moult slowly as they

travel southwards. Of most species the adult males are the next to leave, to be followed perhaps a week later by the adult females. One by one the various migratory species disappear until only the few resident birds are left, and the Arctic forest and tundra resume the silence so conspicuous in winter. As the nights get longer the frosts bring down the leaves from the birch and the larch trees. Summer gently falls asleep, and winter as gently steals a march upon her, with no wind and no snow, until the frost silently lays its iron grip upon the river, which, after a few impotent struggles, yields to its fate. The first and mayhap the second ice is broken up, and when the *starosta* of the village sallies forth to peg out with rows of birch trees the winter road down the river to the next village, for which he is responsible, he has frequently to deviate widely from the direct course in his efforts to choose the smoothest ice and find a channel between the hummocks that continually block the way.

The date upon which winter resumes his sway varies greatly in different localities, and probably the margin between an early and a late season is considerable. In 1876 Captain Wiggins was frozen up in winter quarters on the Yenisei in latitude 66½° on October 17. In 1878 Captain Palander was frozen up on the coast 120 miles west of Bering Strait in latitude 67¾° on September 28.

The sudden arrival of summer on the Arctic Circle appears to occur nearly at the same date in all the great river-basins, but the number of recorded observations is so small that the slight variation may possibly be seasonal and not local. The ice on the Mackenzie River is stated by one authority to have broken up on May 13 in latitude 62°, and by another on May 9 in latitude 67°. If the Mackenzie breaks up as fast as the Yenisei—that is to say, at the rate of a degree a day—an assumption which is supported by what little evidence can be found—then the difference between these two seasons would be nine days. My own experience has been that the ice of the Pechora breaks up ten days before that of the Yenisei, but as I have only witnessed one such event in each valley, too much importance must not be attached to the dates.

According to the *Challenger* tables of isothermal lines, the mean temperatures of January and July on the Arctic Circle in the valleys of the Mackenzie and the Yenisei scarcely differ, the summer temperature in each case being about 55° F., and that of winter −25° F., a difference of 80° F.

On the American side of the Polar Basin summer comes almost as suddenly as it does on the Asiatic side, but the change appears to be less of the nature of a catastrophe. The geographical causes which produce this result are the smaller area of the river-basins and the less amount of rainfall. There is only one large river which empties itself into the Arctic Ocean on the American side, the Mackenzie, with which may be associated the Saskatchewan, which discharges into Hudson Bay far away to the south. The basin of the Mackenzie is estimated at 590,000 square miles, whilst that of the Yenisei is supposed to be exactly twice that area. The comparative dimensions of the two summer floods are still more diminished by the difference in the quantity of snow.

The snow in the Mackenzie basin is said to be from 2 to 3 feet deep,

whilst that in the Yenisei basin is from 5 to 6 feet deep, so that the spring flood in the latter river must be about five times as large as that of the former.

Another feature in which the basin of the Mackenzie differs from those of the rivers in the Arctic regions of the Old World is the number of rapids and lakes contained in it. The ice in the large lakes attains a thickness at least twice as great as that of the rapid stream, and consequently breaks up much later. In the Great Slave Lake the ice attains a depth of 6 to 7 feet, and even in the Athabasca Lake, in latitude 58°, it reaches 4 feet. The rapids between these two lakes extend for 15 miles. The ice on the river breaks up a month before that on the lakes, so that the drainage area of the first summer flood is much restricted.

The arrival of summer in the Arctic regions happens so late that the inexperienced traveller may be excused for sometimes doubting whether it really is going to come at all. When continuous night has become continuous day without any perceptible approach to spring, an alpine traveller naturally asks whether he has not reached the limit of perpetual snow. It is true that here and there a few bare patches are to be found on the steepest slopes, where most of the snow has been blown away by the wind, especially if these slopes face the south, where even an Arctic sun has more potency than it has elsewhere. It is also true that small flocks of little birds—at first snow-buntings and mealy redpoles, and later shore larks and Lapland buntings—may be observed to flit from one of these bare places to another looking for seeds or some other kind of food, but after all evidently finding most of it in the droppings of the peasants' horses on the hard snow-covered roads. The appearance of these little birds does not, however, give the same confidence in the eventual coming of summer to the Arctic naturalist as the arrival of the swallow or the cuckoo does to his brethren in sub-Arctic and sub-tropic climates. The four little birds just mentioned are only gipsy migrants that are perpetually flitting to and fro on the confines of the frost, continually being driven south by snowstorms, but ever ready to take advantage of the slightest thaw to press northwards again to their favourite Arctic home. They are all circumpolar in their distributions, are as common in Siberia as in Lapland, and range across Canada to Alaska as well as to Greenland. In sub-Arctic climates we only see them in winter, so that their appearance does not in the least degree suggest the arrival of summer to the traveller from the south.

The gradual rise in the level of the river inspires no more confidence in the final melting away of the snow and the disruption of the ice which supports it. In Siberia the rivers are so enormous that a rise of 5 or 6 feet is scarcely perceptible. The Yenisei is three miles wide at the Arctic Circle, and as fast as it rises the open water at the margin freezes up again and is soon covered with the drifting snow. During the summer which I spent in the valley of the Yenisei we had 6 feet of snow on the ground until the first of June. To all intents and purposes it was mid-winter, illuminated with what amounted to continuous daylight. The light was a little duller at midnight, but not so much so as during the occasional snowstorms that swept through the

forest and drifted up the broad river-bed. During the month of May there were a few signs of the possibility of some mitigation of the rigours of winter. Now and then there was a little rain, but it was always followed by frost. If it thawed one day it froze the next, and little or no impression was made on the snow. The most evident sign of coming summer was an increase in the number of birds, but they were nearly all forest birds, which could enjoy the sunshine in the pines and birches, and which were by no means dependent on the melting away of the snow for their supply of food. Between May 16 and 30 we had more definite evidence of our being within bird-flight of bare grass or open water. Migratory flocks of wild geese passed over our winter quarters, but if they were flying north one day they were flying south the next, proving beyond all doubt that their migration was premature. The geese evidently agreed with us that it ought to be summer, but it was as clear to the geese as to us that it really was winter.

We afterwards learnt that during the last ten days of May a tremendous battle had been raging 600 miles as the crow flies to the southward of our position on the Arctic Circle. Summer in league with the sun had been fighting winter and the north wind all along the line, and had been as hopelessly beaten everywhere as it had been before our own eyes in our part of the river. At length, when the final victory of summer looked the most hopeless, a change was made in the command of the forces. Summer entered into an alliance with the south wind. The sun retired in dudgeon to his tent behind the clouds, mists obscured the landscape, a soft south wind played gently on the snow, which melted under its all-powerful influence like butter upon hot toast, the tide of battle was suddenly turned, the armies of winter soon vanished into thin water and beat a hasty retreat towards the Pole. The effect on the great river was magical. Its thick armour of ice cracked with a loud noise like the rattling of thunder; every twenty-four hours it was lifted up a fathom above its former level, broken up, first into ice floes and then into pack ice, and marched down stream at least a hundred miles. Even at this great speed it was more than a fortnight before the last straggling ice-blocks passed our post of observation on the Arctic Circle, but during that time the river had risen 70 feet above its winter level, although it was three miles wide, and we were in the middle of a blazing hot summer, picking flowers of a hundred different kinds, and feasting upon wild ducks' eggs of various species. Birds abounded to an incredible extent. Between May 29 and June 18 I identified sixty-four species which I had not seen before the break-up of the ice. Some of them stopped to breed and already had eggs, but many of them followed the retreating ice to the tundra, and we saw them no more until, many weeks afterwards, we sailed down the river beyond the limit of forest growth.

The victory of the south wind was absolute, but not entirely uninterrupted. Occasionally the winter made a desperate stand against the sudden onrush of summer. The north wind rallied its beaten forces for days together, the clouds and the rain were driven back, and the half-melted snow frozen on the surface. But it was too late; there were many large patches of dark ground which rapidly absorbed the sun's

heat; the snow melted under the frozen crust, and its final collapse was as rapid as it was complete.

In the basin of the Yenisei the average thickness of the snow at the end of winter is about 5 feet. The sudden transformation of this immense continent of snow, which lies as gently on the earth as an eider-down quilt upon a bed, into an ocean of water rushing madly down to the sea, tearing everything up that comes in its way, is a gigantic display of power compared with which an earthquake sinks into insignificance. It is difficult to imagine the chaos of water which must have deluged the country before the river-beds were worn wide enough and deep enough to carry the water away as quickly as is the case now. If we take the Lower Yenisei as an example, it may be possible to form some conception of the work which has already been done. At Yeniseisk the channel is about a mile wide; 800 miles lower down (measuring the windings of the river), at the village of Kureika, it is about 3 miles wide, and following the mighty stream for about another 800 miles down to the Briokhoff Islands, it is nearly 6 miles wide. The depth of the channel varies from 50 to 100 feet above the winter level of the ice. This ice is about 3 feet thick, covered with 6 feet of snow, which becomes flooded shortly before the break-up and converted into about 3 feet of ice, white as marble, which lies above the blue winter ice. When the final crash comes this field of thick ice is shattered like glass. The irresistible force of the flood behind tears it up at an average rate of 4 miles an hour, or about a hundred miles a day, and drives it down to the sea in the form of ice floes and pack ice. Occasionally a narrow part of the channel or a sharp bend of the river causes a temporary check; but the pressure from behind is irresistible, the pack ice is piled into heaps, and the ice floes are doubled up into little mountains, which rapidly freeze together into icebergs, which float off the banks as the water rises. Meanwhile, other ice floes come up behind: some are driven into the forests, where the largest trees are mown down by them like grass, whilst others press on until the barrier gives way, and the waters, suddenly let loose, rush along at double speed, carrying the icebergs with them with irresistible force, the pent-up dam which has accumulated in the rear often covering hundreds of square miles. In very little more than a week the ice on the 800 miles from Yeniseisk to the Kureika is completely broken up, and in little more than another week the second 800 miles from the Kureika to the Briokhoff Islands is in the same condition.

During the Glacial Epoch the annual fight between winter and the sun nearly always ended in the victory of the former. Even now the fight is a very desperate one within the Polar Circle, and is subject to much geographical variation. The sun alone has little or no chance. The armies of winter are clad in white armour, absolutely proof against the sun's darts, which glance harmlessly on six feet of snow. In these high latitudes the angle of incidence is very small, even at mid-day in mid-summer. The sun's rays are reflected back into the dry air with as little effect as a shell which strikes obliquely against an armour plate. But the sun does not fight his battle alone. He has allies which, like the

arrival of the Prussians on the field of Waterloo, finally determine the issue of the battle in his favour. The tide of victory turns earliest in Norway, although the Scandinavian Fjeld forms a magnificent fortress, in which the forces of winter entrench themselves, however, in vain. This fortress looks as impregnable as that on the opposite coast, and would doubtless prove so were it not for the fact that in this part of the Polar Basin the sun has a most potent ally in the Gulf Stream, which soon routs the armies of winter and compels the fortress to capitulate.

The suddenness of the arrival of summer in Siberia is probably largely due to the geographical features of the country. In consequence of the vastness of the area which is drained by the great rivers, and the immense volume of water which they have to carry to the sea, the break-up of the ice in their lower valleys precedes, instead of being caused by, the melting of the snow towards the limit of forest growth. The ice on the affluents either breaks up after that on the main river, or is broken up by irresistible currents from it which flow up stream—an anomaly for which the pioneer voyager is seldom prepared; and when the captain has escaped the danger of battling against an attack of pack ice and ice floes from a quarter whence it was entirely unexpected, he may be suddenly called upon to face a second army of more formidable ice floes and pack ice from the great river itself, and if his ship survive the second attack, a third danger awaits him in the alternate rise and fall of the tributary, as each successive barrier, where the ice gets jammed in its march down the main stream below the junction of the river, accumulates until the pressure from behind becomes irresistible, when it suddenly gives way. This alternate advance and retreat of the beaten armies of winter continued for about ten days during the battle between summer and winter of which I was a witness in the valley of the Yenisei. On one occasion I calculated that at least 50,000 acres of pack ice and ice floes had been marched up the Kureika. The marvel is what became of it. To all appearance half of it never came back. Some of it no doubt melted away during the ten days' marches and counter marches, some drifted away from the river on the flooded places, which are often many square miles in extent, some got lost in the adjoining forests, and was doubtless stranded amongst the trees when the flood subsided, and some was piled up in layers one upon the top of the other, which more or less imperfectly froze together and formed icebergs of various shapes and sizes. Some of the icebergs which we saw going down the main stream were of great size, and as nearly as we could estimate stood from 20 to 30 feet above the surface of the water. These immense blocks appeared to be moving at the rate of from 10 to 20 miles an hour. The grinding together of the sharp edges of the innumerable masses of ice, as they were driven down stream by the irresistible pressure from behind, produced a shrill rustling sound that could be heard a mile from the river.

The alternate marching of this immense quantity of ice up and down the Kureika was a most curious phenomenon. To see a strong current up stream for many hours is so contrary to all previous experience of the behaviour of rivers that one cannot help feeling continuous astonishment at the novel sight. The monotony which might otherwise have inter-

vened in a ten-days' march-past of ice was continually broken by complete changes in the scene. Sometimes the current was up stream, sometimes it was down, and occasionally there was no current at all. Frequently the pack ice and ice floes were so closely jammed together that there was no apparent difficulty in scrambling across them, and occasionally the river was free from ice for a short time. At other times the river was thinly sprinkled over with ice blocks and little icebergs, which occasionally 'calved' as they travelled on, with much commotion and splashing. The phenomenon technically called 'calving' is curious, and sometimes quite startling. It takes place when a number of scattered ice blocks are quietly floating down stream. All at once a loud splash is heard as a huge lump of ice rises out of the water, evidently from a considerable depth, like a young whale coming up to breathe, noisily beats back the waves that the sudden upheaval has caused, and rocks to and fro for some time before it finally settles down to its floating level. There can be little doubt that what looks like a comparatively small ice block floating innocently along is really the top of a formidable iceberg, the greater part of which is a submerged mass of layers of ice piled one on the top of the other, and in many places very imperfectly frozen together. By some accident, perhaps by grounding on a hidden sandbank, perhaps by the water getting between the layers and thawing the few places where they are frozen together, the bottom layer becomes detached, escapes to the surface, and loudly asserts its commencement of an independent existence with the commotion in the water which generally proclaims the fact that an iceberg has calved.

Finally comes the last march-past of the beaten forces of winter, the ragtag and bobtail of the great Arctic army that comes straggling down the river when the campaign is all over—worn and weather-beaten little icebergs, dirty ice floes that look like floating sandbanks, and straggling pack ice in the last stages of consumption that looks strangely out of place under a burning sun between banks gay with the gayest flowers, amidst the buzz of mosquitoes, the music of song-birds, and the harsh cries of gulls, divers, ducks, and sandpipers of various species.

I have been thus diffuse in describing these scenes, in the first place, because they are very grand; in the second place, because they have so important a bearing upon climate, one of the great factors which determine the geographical distribution of animals and plants; and in the third place, because they have never been sufficiently emphasised.

NOTES OF A JOURNEY IN SOUTH AFRICA.

The following letter has been received by Professor Geikie from Mr. John Baylie Don, B.Sc., a former pupil of his, and will be read with interest, as it treats of certain regions which are still very imperfectly known :—

"I came out to South Africa in 1890, and after a year in Cape Town and Johannesburg began to carry out my long-cherished desire to explore Africa, by setting out for Fort Salisbury with a friend, who was also seeking his fortune in the promised land.

"We travelled alone and on foot, carrying our possessions on four pack donkeys which we drove before us, and in this way traversed the Transvaal to its most northern point, and then Mashonaland, from the Limpopo to Fort Salisbury. After an exceedingly pleasant and interesting journey we reached our temporary destination. I should have liked to have advanced still farther up the country, but money was necessary and the rainy season at hand, so, my friend being an experienced prospector, we counted ourselves fortunate in receiving a commission from the British South Africa Company to prospect and explore the country between 19° and 21° south latitude along the watershed between the Sabi and the Buzi—in fact, the debated Portuguese Frontier. In pursuance of this object we retraced our steps to Fort Victoria, and there left the road and crossed the Sabi valley to the east, a country little known to Europeans, striking, near Umtali, the Umtali-Salisbury road (at Umtali the Beira route enters Mashonaland), where we met a few white men prospecting the Umtali gold-field.

"Having found out our exact position, we immediately left the road again and followed the watershed southwards through almost unknown country till we reached our southern limit, which may be called, after its reigning chief, Shikwanda. While camped here we heard of a white man who lived some days' journey off to the south-east, and before setting out on our return I determined to visit him and find out who he was. Leaving Shikwanda's with two natives, on March the 21st, 1892, I reached the white man's on the 23rd, and found him to be Senhor Mario Barreto, who with Senhor Falcão represents the Portuguese Government in Gazaland; his place is called Mussurise and was the site of Gungunhana's old Kraal (Gungunhana migrated five years ago to the Limpopo mouth). Having been treated with the greatest kindness by Senhores Barreto and Falcão I got back to camp and found my friend slightly unwell. This was our first experience of malarial fever, and we had been very much misled by accounts, emanating from sources that seemed most trustworthy, as to its danger and the possibility of avoiding it during the season. However, experience is a good master. As my friend gradually grew worse, I sent two natives with a note to Barreto asking for assistance. The next day, the 8th of April, my friend died at about 2 A.M. As we had no attendants I was now quite alone, and, from the extraordinary weakness I felt, perceived that the fever had me well in its grip, though not manifesting itself in the acute form. With great difficulty I buried

my friend. Day by day I grew weaker till I hardly had strength to get water or make a fire. I could not help reflecting how easily my messengers might shirk the journey, and that, even if they were faithful, Barreto might do nothing. I reckoned that if the messengers had gone at their best pace I might possibly receive a reply on the 13th. The 13th came, and just at sunset Barreto and Falcão, mounted on donkeys and followed by their whole establishment, rode up. Next day we set out for Mussurise, and when we reached that place on the 21st I was much better. Here I spent ten days, Barreto and Falcão sparing no pains to make me comfortable. On the 28th of April I set out for the coast in a hammock which, with nine carriers, Barreto lent me free of charge. He also lent me £15, an act of no common generosity, considering that he had no security and that I was an utterly unknown stranger of a nation not very friendly with his own. Striking the Buzi on the 8th of May, I followed it down to a trading outpost where I procured a canoe to take me to Beira, which I reached on the 11th of May. Here I remained till the 31st, when I left on a steamer for King William's Town, where I have been ever since. I soon shook off the fever, and have never had a return.

"As regards natural features, no doubt you are well acquainted with the general descriptions of South Africa and its geology. Professor A. H. Green[1] has well summarised the Geology of Cape Colony. From Cape Town to Johannesburg the treeless country rises suddenly within fifty miles of the former town from under 1000 to over 3000 feet, and then, on the whole, steadily rises to 5000 or 6000 feet at Johannesburg. Between Cape Town and Kimberley flat stretches are the rule, but mountains are always in sight. From Kimberley to Johannesburg the country is more undulating and more richly grassed, but without any conspicuous elevations in sight.

"Johannesburg is on the summit of the Vaal-Limpopo watershed, and its geology is, no doubt, well known to you. Its strata seem to me not easily defined. Sedimentary strata half metamorphosed they might be called, but this description might also be applied to very much simpler formations. Probably the structural peculiarity of the neighbourhood, compared with that of immense stretches on either hand, is connected with its unique position on the summit, not merely of a mountain range, but of a vast mass of land 1000 miles across at its base. One peculiarity that struck me was that quantities of talcose stuff are often found mixed up with apparently sedimentary sandstone. Possibly the great mass of what I take to be siliceous sinter, which is found 20 miles to the north, near Pretoria, may have some connection with the Johannesburg formation. This sinter is pierced from above by numerous holes, some 25 feet deep, apparently made by natives to mine ferruginous veins.

"Within the first 50 miles beyond Johannesburg you rapidly descend 1000 feet or more, crossing the crest of the watershed and descending the northern side, where you enter a new region, having exchanged the open country of the south for a land uniformly (except a few isolated areas, usually flat hill-tops) covered with more or less open wood. The

[1] *Quarterly Journal of the Geological Society of London*, 1888.

quartzite ridge of the Magaliesberg, running east and west past Pretoria, crosses this region near its southern boundary; beyond, plains covered with mimosa wood and 3000 to 4000 feet above the sea-level stretch to Pietersburg, half way to the Limpopo. About half way to Pietersburg these are crossed by the sandstone (tilted vertical) and shale ridge of the Waterberg, and just south of Pietersburg by the ridge of the Marabas Stad mountains, composed of sandstone lying unconformably on schist, while Pietersburg itself lies on one of the open grassy plateaus more than 4000 feet above the sea.

"Beyond the elevated Pietersburg clearing there is a change in the vegetation, the thorn giving place to the *mopani* (*Bauhinia*) as the predominant tree, and the general level of the plains is rather lower, gradually descending to 1700 feet at the Limpopo. In this region, too, the *kopje* of granite (small isolated hill, sometimes a solid mass, sometimes a pile of angular fragments), so characteristic of Mashonaland, first appears.

"However, perhaps its most important feature is its aridness, for, except in a few highly mineralised rivers, water is not to be found. This region is crossed about half way between Pietersburg and the Limpopo by the ridge of the Zoutpansberg, the most imposing mountains on the route, formed of quartzite dipping to the north.

"Between the Zoutpansberg and the Limpopo it is still more arid than to the south, and is by far the most desolate and uninhabited stretch of country I have seen in Africa. It is a dead flat of granite, mica-schist, and other metamorphic rocks, almost destitute of *kopjes*, up to within 10 miles of the Limpopo (a little west of that part marked on recent maps as lying to the north of the 22nd parallel). Here a most singular formation of raised pavements of sandstone crosses the country, forming detached flat-topped hills 60 feet or so above the general level, and quite bare of grass or soil, although a few trees cling here and there in the interstices.

"The flat tops have been worn by some means into huge pot-holes, forming reservoirs of good water, some of which are so deep as to be inaccessible to wild animals long before they are drunk dry, and are full of a deep green slime, the product of ages. The sandstone, though so well exposed, has not the faintest trace of bedding planes, and is coarse-grained and brownish grey. The only break in its homogeneity I ever saw was a thing like a half walnut shell, apparently half imbedded in a weathered surface, due, I take it, to a spherical shell of induration weathering out and getting broken. The course of the Limpopo is marked by a dense belt of forest of large trees, quite different from the open *mopani* wood on either side.

"From the Limpopo to the Lunde, not quite half way to Salisbury, much the same vegetation prevails as from Pietersburg to the Limpopo, *i.e.* *mopani*, baobab, etc., but the country is not so arid, being crossed by many sandy river-beds with either surface or sub-surface water. The Tuli, the most remarkable of these, has a sandy bed half a mile wide and more, but in winter the total width of flow is not 10 yards. The general level of the land does not vary much from 2000 feet as you pass from the Limpopo basin into that of the Sabi. As far as the Umzingwani, about 50 miles

beyond the Limpopo, the formation is a peculiar heavy compact rock full of white amygdales of quartz, and having a granulated roe-like structure, picked out with white, on exposed weathered surfaces. It splits into small cubical blocks, and is quite decomposed in many places, shelling off in cuboidal masses after the manner of basalt. It covers the country to the exclusion of any other rock, and is, I believe, a volcanic stream. At the drift of the Umzingwani there is a small, apparently isolated, hill of soft clayey, structureless sandstone, and then comes the Mashonaland granite, which, almost unbroken, occupies the rest of the country.

"This uniform granite formation is by far the most prominent geological characteristic of Mashonaland, and, indeed, of most of the interior. Sometimes it rises into mountains, but usually the general level is only broken by low *kopjes*, and in those parts where the bed-rock and surface are flattest the *kopjes* present the most singular appearance. The whole country seems dotted with huge kerbstones, and in whichever direction you look they gradually close in the vista as the trunks of the trees would in a forest, that is, if you stand above the general level of the real forest which everywhere clothes the country. Some of these kerbstones are 300 feet or more high, sheer all round, and apparently of smaller diameter than height. Sometimes the original mass has been so broken up as to form the most marvellous steeple-like structures springing out of the rich foliage clinging in all the crevices. All the native huts are built on these *kopjes* in the most inaccessible positions.

"From the Lunde to Fort Victoria you rise, in 50 miles, 2000 feet or so to the general level of the so-called plateau—I say so-called, because it is so much cut up by valleys as to be rather a net-work of ridge-lines. The average level is very high, even the valleys being never less than 2000 or 3000 feet above the sea-level. Instead of the *mopani*, a tree with feathery foliage prevails often almost to the exclusion of all other types. The inner bark of this tree is used for tying and wrapping up all kinds of packages, and is sometimes woven into cloth. This region continues to Fort Salisbury and indefinitely in all directions along the main ridge-lines. Viewed from the road between Victoria and Salisbury, which follows the main ridge-line, it consists of open forest traversed by marshy glades, most of which, however, are dry in winter. The level varies from 4000 to 5000 feet, and the country is very slightly undulating. At one stretch, where the road follows the very ridge of the watershed, it traverses treeless country for 30 miles or so. *Kopjes* still occur, but are very much more insignificant than in the lower and flatter country.

"On the ascent, from the Lunde on to the plateau, there is no distinct escarpment, but only a rather broken, hilly country leading gradually to a higher level. In this broken country the granite is crossed by east and west ridges of schist which form a well-marked feature in contrast to the granite *kopjes*. At Fort Salisbury there is a somewhat isolated outcrop of schist, and everywhere there are occasional outcrops of greenstone in the granite.

"So far I have been describing the characteristics along the beaten track.

When we left the road and went eastward, we soon found that the apparent flatness of the main road was illusory. As soon as we got some distance from the main axis of the ridge we came into broken country where there were frequent rough, though unimportant, escarpments. The geology, however, was just the same—granite everywhere, broken near the Sabi by an outcrop of schist, which is continuous with the Umtali and Massi-Kessi gold-belt beyond and, possibly, with the Victoria belt.

"The Sabi, where we crossed it, seemed to be descending from the mountain (or plateau) and entering on its more level course, for below us it wound away to the south-east through a wide plain, the mountains receding on either side till lost in haze, while above us they closed in all round.

"The topography of this locality was rather interesting, but too complicated to describe. One noticeable feature was that the course of the river through its plain was beaconed out by granite *kopjes*. The vegetation was a mixture of those of the plateau and the *mopani* regions.

"Beyond the Sabi and its tributary the Odzi, there is, towards Umtali and Massi-Kessi, rather a low neck on the watershed between them and the sea, but both to the north and south the watershed rapidly rises to very broken and mountainous country, and, going south-eastwards, we had an exceedingly stiff pull to get on to it. We struck the ridge-line about 40 miles south of Umtali and found it a chain of exceedingly precipitous mountains connected by saddles so narrow that sometimes there was an open grassy stretch not more than 50 or 100 yards wide between an exceedingly precipitous drop of 1000 feet or more on the one side to the flattish, wooded country drained by the Revue, and on the other to deep-wooded valleys, running away like great trenches to the Sabi, and separated from one another by wall-like spurs running out at right angles to the main axis.

"This watershed was marked on the Rhodesia map as a grassy plateau, and we determined to follow it southwards till we reached the plateau, or proved its non-existence, thus avoiding at the same time the presumably unhealthy country to the east and the certainly impracticable and also unhealthy country to the immediate west. After marching along it for 6 miles we came to a total change of formation, leaving behind the granite and coming on to hard, fine-grained sandstone or quartzite lying perfectly flat. On the eastern slope of the neck the division between the formations was marked by a tremendous chasm 1000 feet deep at least. On the west there was no corresponding chasm, but merely a shallow upland valley running some miles before it became a rugged gorge—almost the first open valley we had seen since leaving Pietersburg.

"The very first mountain of the new formation was the highest we saw or ascended in the country, being almost 8000 feet.

"The watershed range now consisted of a chain of parallel, flat-topped spurs, running east and west. The summits were grassy and open and each several square miles in area, and the western valleys separating them from one another were for some miles shallow and unwooded, before they passed over the escarpment towards the Sabi and its wooded broken country. The vegetation in the lower courses of the valleys on either

side was still the same, but, especially on the eastern slope, there were frequent patches of dense, dripping forest of large timber, quite different from the usual open forests of the interior, and very like those of Cape Colony. Bracken and brambles mingled with the grass in the open, and there were forests of heaths so gigantic that one might climb many feet above the ground among their branches. Huge tree-ferns were also common, and lines of them growing along a shallow depression often marked an underground watercourse, to which, here and there, a well descended, choked with tree- and other ferns, the plashing of the water being audible through the foliage.

"As we went on southwards, the western valleys again became very broken and were wooded from their very sources, but open shallow valleys separated by low ridges ran out to the east, and finally the mountains suddenly dropped from 6000 to 4000 feet, the watershed no longer rising above the general level of its eastern spurs, and the whole forming an open undulating plateau of low grassy ridges and boggy hollows about 1000 square miles in extent. This was the Gazaland plateau, and here it was my companion died.

"The sandstone formation was still the same, and still, apparently, quite horizontal. This I judge from the fact that where we first struck it the sandstone, while hard and of a quartzite texture at an elevation of 7000 feet, was interstratified towards the upland valley-bottoms, at 4000 feet, with a thin shale and with a thick red earthy bed, and here on the plateau the same horizontal beds again cropped out at the same level.

"This plateau gives birth to, and is bounded on the south by, the Buzi, beyond which, on my way south-south-eastwards to Mussurise, I crossed several wooded ridges and marshy plains, and then, surmounting the ridge which had bounded our southern view, suddenly entered a new floral region, which extends to the coast, and is chiefly remarkable for its extraordinary rank grass, sometimes 15 feet high. In fact, in the hilly tract of 50 miles through which I descended from the ridge, some 4000 feet high, to Mussurise, it was hardly ever less than 10 feet long. In this tract, which forms the southern end of the plateau, the sandstone gives place to an igneous formation similar to, and possibly continuous with, that crossed just north of the Limpopo. How far it extends southwards I do not know, for my farthest point was about 21°, and the country farther to the south-west, south, and south-east, between the Transvaal and the sea, is much less known than the more distant Zambezi and lake regions, though traversed in part by St. Vincent Erskine in 1871, Dr. Jameson in 1891, and the Anglo-Portuguese Boundary Commission in 1892.

"Mussurise (the Gungunhana of maps) is about 800 feet above the sea-level, and from thence north-east to the Buzi where I struck it, thirty miles inland and about the same distance along the river above the tidal limit, is an arid, wooded, flat country, almost destitute of flowing water for 120 miles together. Being sick I did not notice accurately, but I believe that the igneous region was succeeded by a schistose belt, and then, 50 miles from the coast, a wide belt of sedimentary limestone occurred, followed by alluvium and mangrove swamp.

"The plains both in the North Transvaal and in the lower parts of Mashonaland appear to be all plains of denudation, and are as a rule quite destitute of sedimentary deposit. The sandstone just south of the Limpopo and a coarse grit on the plain north of the Magaliesberg are exceptions, and I also noticed a few outcrops of what seemed to be altered grit or mudstones.

"Almost everywhere in Africa, as far as I know, the subsoil immediately above the bed-rock is cemented together either by calcareous matter, as in the metamorphic parts of the Transvaal, or by ferruginous matter, as in the igneous, sedimentary, and granite regions. In flat marshy places the lime is pure and abundant enough to be worked, and in similar situations the ferruginous cement approaches to bog iron ore.

"The geology of the Transvaal is very much more complicated than that of Mashonaland, and the numerous metamorphic regions, especially in its north-eastern parts, lead me to expect future finds of gold there rather than in the latter country. Though prospecting a region said to be rich in deposits, we saw not one speck of gold after leaving the Umtali gold-belt. From the tops of the high mountains of the watershed we could see, far to the east, rising out of the Portuguese low country, a great ragged mountain mass, apparently schistose and, possibly, gold-bearing.

"Mashonaland is a country fertile enough for native grains, etc., and would prosper without the gold, were it not for the real drawback to Africa from the European point of view, that is, fever. Most people imagine that, because Africa has been found to be a very elevated country, therefore, despite all experience to the contrary, it *must* be healthy. My opinion is that, though it is undoubtedly a continent of great elevation, yet it is still more undoubtedly the most deadly, even on these elevated areas. I was born and lived five years in the delta of the Ganges, where the heat is incomparably greater than on the African plateau, or even on the sea-board. Cholera, etc., are endemic. But the death-rate among white men from malarial fever is altogether insignificant compared to what it is on the African plateau.

"Of course all this only refers to the main mass of the continent within the Tropics. South of this, the region containing the Cape Colony, the Orange Free State, Natal, most of Zululand, and the Southern Transvaal is as free from malarial fever as Edinburgh.

"As the boundary of the healthy region is neither a contour line nor a parallel of latitude, no doubt the winds prevailing at certain seasons have an important effect. I should mention that in Mashonaland generally the sickly season is from January to April. The rest of the year is healthy, and all the year round the climate is pleasant and not too hot. King William's Town is quite as hot as any part of Mashonaland."

BRITISH ASSOCIATION, 1893.

THE Annual Meeting of the British Association was held this year in Nottingham. The Meeting was opened on Wednesday, September 13th, and the address of the President, J. S. Burdon-Sanderson, M.A., LL.D., F.R.S., F.R.S.E., was delivered on the same evening in the Albert Hall.

The following were the Office-bearers of

SECTION E.—GEOGRAPHY.

President.—Henry Seebohm, Sec. R.G.S., F.L.S., F.Z.S.

Vice-Presidents.—Prof. Bonney, D.SC., F.R.S., ; J. Y. Buchanan, M.A., F.R.S. ; Colonel Godwin-Austen, F.R.S. ; J. Scott Keltie, F.R.G.S. ; Clements R. Markham, C.B., F.R.S., Pres. R.G.S. ; E. Delmar Morgan, F.R.G.S. ; E. G. Ravenstein, F.R.G.S.

Secretaries.—Lieut.-Col. Bailey, (*late*) R.E., Sec. R.S.G.S., F.R.G.S. ; John Coles, F.R.G.S., F.R.A.S. ; H. O. Forbes, F.R.G.S. ; H. R. Mill, D.SC., F.R.S.E., F.R.G.S. (*Recorder*).

Committee.—Dr. W. G. Blackie ; J. Bolton ; Right Hon. Sir George F. Bowen, G.C.M.G. ; Anderson Brownsword (Mayor of Nottingham) ; W. M. Conway ; H. N. Dickson, F.R.S.E. ; Dr. R. W. Felkin ; Rev. H. de B. Gibbins, M.A. ; E. Heawood, M.A. ; Sir Henry Howorth, F.R.S. ; Prof. J. Milne, F.R.S. ; H. Yule Oldham, M.A. ; Trelawney Saunders ; Dr. H. Schlichter ; G. E. T. Smithson ; Eli Sowerbutts ; Dr. H. Owen Taylor ; Herbert Ward ; Cope Whitehouse ; Captain Williams, R.A.

The following is a list of the Papers read before the Section, with, in some cases, abstracts of their contents :—

Thursday, September 14th.

1. PRESIDENT'S ADDRESS.
   [Published as the first article in this number of the *Scottish Geographical Magazine.*]
2. GUY BOOTHBY.—A Journey across Australia, from North to South.
3. Mrs. LILLY GROVE, F.R.G.S.—The Islands of Chiloë.
   [These two papers will appear in subsequent numbers of the Society's *Magazine.*]
4. E. G. RAVENSTEIN.—Recent Explorations in Katanga.
5. Prof. J. MILNE, F.R.S.—Pictures of Japan, shown by the oxy-hydrogen lantern.

Friday, September 15th.

1. A Discussion was held in the Meeting-Room of Section E between Sections C (Geology) and E on the limits between Geology and Physical Geography. Sir Archibald Geikie presided, and the discussion was opened by papers by
   (1) CLEMENTS R. MARKHAM, C.B., F.R.S.
   (2) W. TOPLEY, F.R.S., F.G.S.

[Mr. Markham's paper will appear in the November number of the *S.G.M.*]

2. W. M. CONWAY.—Report of the Karakoram Expedition, with oxy-hydrogen illustrations.

The exploring party in the Karakoram mountains in 1892 consisted of Mr.

W. M. Conway, Lieutenant the Hon. C. G. Bruce, Mr. A. D. M'Cormick, Mattias Zurbriggen (an Alpine guide), and four Gurkha sepoys. For part of the time they were accompanied by Messrs. Roudebush and Eckenstein, and also by Colonel Lloyd Dicken.

The party reached Gilgit, on a tributary of the Indus, and made their first exploring expedition up the Bagrot valley, since the highest ranges were as yet (May) inaccessible, owing to the amount of snow still unmelted. The work being on a larger scale than the Indian Survey, the features of the higher ground, particularly the glacier, were much improved in detail, and the names of all the tributary glaciers recorded. An attempt to cross from it into Nagyr over the main ridge was defeated, so the party returned to Gilgit. Some interesting observations were made on the mud avalanches in this region. These are vast masses of mud, thickly mingled with huge blocks of rock, which are swept down the gorges in the steep mountain flanks on to the more level parts of the valley, and become important factors in modifying this part of the earth.

Departing again from Gilgit, the travellers visited the rock-bound valley of Hunza-Nagyr. The weather was unpropitious, but another attempt (not completely successful) was made to reach the Bagrot pass from this northern side, and an expedition was undertaken to the Barpu glacier. One branch of this was explored and mapped, and a peak which rises at its head was ascended. The ridge separating this tributary (Barpu) valley from the main Hispar valley was traversed by a pass about 16,000 feet above sea-level. From the latter valley the most important glacier expedition was undertaken, for the Hispar pass (17,600 feet) was crossed to Askoli, which was reached on July 26, nearly a fortnight having been spent on, or by the side of, the two great glaciers which stream from the summit (gained on July 18). Their combined length is about sixty-seven miles, and they both terminate at some 10,000 feet above the sea-level.

Askoli was left on July 31 for an expedition to the great Baltoro glacier, and a good view was obtained of K_2 (or Mount Godwin-Austen) (28,278 feet), which rises grandly from the upper part of this ice-region. Pioneer Peak (22,500 feet), a minor summit of the Golden Throne at the head of the Baltoro glacier, was climbed, as well as a lower (Crystal) peak.

The party returned to Askoli on September 5, and crossed southwards from that place by the Skoro pass (about 17,000 feet) to Askoro in the Shigar valley, whence they reached Skardo on the Indus. From it they visited Leh, and regained Abbotabad (whence they had started on their journey to Gilgit) after an absence of seven months.

Mr. Conway has added some 600 square miles of quite new topography east of Hunza-Nagyr and north of the Rakapushi range, up to near the longitude of the Nushik La. His route-map up the Hispar glacier, down the Biafo, and on again to the Baltoro is based on, and kept in proper position by, the topographical work of the Indian Survey on the four miles to the inch scale, executed in 1860-61, but is much enlarged, showing consequently a great deal of close detail either sketched in on the spot or taken from photographs. The portion near the Hispar pass, never before crossed by any European travellers, has thus been very accurately laid down. He has also corrected the topography of the tributary glaciers at the head of the Baltoro, which Lieut.-Colonel Godwin-Austen, when making his survey of it, was only able to plane-table roughly from a distance of fifteen to twenty miles.

This detail work of Mr. Conway covers about 1200 square miles, and is an instructive piece of Alpine topography, because the scale is large enough to show the

extent and proportions of the ice- and snow-covered surface, and the size and position of the lateral and medial moraines, etc.

3. Report of the Committee on Scottish Place-Names.
   [This Report will be published in the *Proceedings* of the Society.]
4. J. Y. Buchanan, F.R.S.—The Influence of Land on the Temperature of the Air.
   [This Paper will be published in the *Magazine*.]
5. H. N. Dickson, F.R.S.E.—Physical Geography of the Sea between Scotland and the Faröe Islands.
   [Mr. Dickson's paper will appear in the *Geographical Journal*.]
6. Dr. H. R. Mill.—Physical Geography of the Clyde Sea Area.
   [Dr. Mill will lecture before the Society on this subject during the coming Session.]
7. Dr. H. R. Mill.—A Bathymetrical Survey of the English Lakes.
   [This paper will be published in the *Geographical Journal*.]

Monday, 18th September.

1. Report of Committee on Explorations in Abyssinia.
2. Report of Committee on the Climate of Africa.
3. Captain Williams, R.A.—Uganda and its People.
4. Rev. C. H. Robinson.—On Hausa Pilgrimages from the Western Sahara.
5. J. Howard Reid.—On the Geography of the Congo Basin.
6. Herbert Ward.—On Environment in relation to the Tribes of the Congo Basin.
7. Dr. H. Schlichter.— On the Vertical Relief of Africa.
   [To appear in the *Geographical Journal*.]
8. Dr. R. W. Felkin.—On the Distribution of African Diseases.

An attempt is made in the map shown by the author to illustrate the grouping of the principal diseases occurring in Africa, so that not only the existence of the disease may be seen, but its comparative prevalence or severity appreciated. This is done by using a symbol for each disease dealt with, to indicate the districts where it exists. The symbol is doubled if the disease is very prevalent, and where it is exceedingly severe three symbols are placed together. The climatology of various areas has also been introduced ; and if this map is referred to one showing the altitude, it is comparatively easy to see why different diseases should be present or absent in any given region.

Thus the map shows that malaria is most intense in the coastal regions and on the banks of the great rivers, that it decreases with altitude, and does not obtain at all after a certain altitude—over 3500 feet. It is not found in the Sahara, except in isolated areas ; again, in the extreme south of the continent it is at once apparent how altitude and climatology limit its production. The distribution of phthisis is also seen to be limited in its incidence by altitude and climatology, and probably also to a certain extent by malaria, for where malaria is most severe phthisis hardly if ever occurs.

9. Cope Whitehouse.—Middle Egypt from Ptolemaic Maps and recent Surveys.

The question whether the maps which accompany the text of Cl. Ptolemy, A.D. 150, were copied from the originals extant in the eleventh century, or were draughted by the copyists of the manuscripts, by plotting the positions given in the text, is of great importance. If there were original maps, contemporary with

the Alexandrian geographer, or not later than the fifth century, then these copies furnish independent and trustworthy information as to those facts stated on them which are not found in Ptolemy's lists of positions. This view has been maintained by the author of this paper since 1882.

The map of Middle Egypt, 1892, by the Ministry of Public Works, Cairo, and the line of levels given by Major Brown in *The Fayûm and Lake Mœris* (1892), run under his direction by Messrs. Joseph and Pini, furnish a crucial test. Noting the successive changes through which this region passed, as shown by its physical conditions, history, and archæological remains, it may be established with certainty that the positions of the places mentioned by Cl. Ptolemy could not have been plotted on a map of the middle ages, or on a map of ancient Egypt reconstructed from the historical and geographical data of Herodotus (B.C. 454), Diodorus (B.C. 20), or Strabo (B.C. 24). Such attempted reconstructions by Linant and others were shown; and the differences between them and Ptolemaic maps from manuscripts in Mount Athos, the Vatican, Milan, and Venice, and of Chrysanthus and Berlinghieri, and from the printed editions of Cl. Ptolemy, were pointed out. The maps of Cl. Ptolemy represent his positions plotted upon a region whose relative areas of land and water only existed, as depicted, after the middle of the first century, and before the end of the third, of our era.

The conclusion is that some, at least, of the maps accompanying the text of Cl. Ptolemy in mediæval manuscripts are copies, more or less faithful, of maps drawn not later than the end of the third century, and that they are probably contemporaneous with the Alexandrian geographer's text, A.D. 150.

Tuesday, 19th September.

1. W. S. Bruce.—Notes on an Antarctic Voyage.
2. Dr. C. M. Donald.—Observations in the Antarctic Regions.
   [Narratives of the Voyage of the Dundee Whalers.]
3. Admiral Sir Erasmus Ommaney.—On the importance of Antarctic Exploration.
   [The paper was followed by a Discussion on Antarctic Exploration. Mr. W. G. Burn Murdoch's paintings made during the voyage of the Dundee Whalers were exhibited in the Meeting-Room.]
4. A. Trevor Battye.—A proposed Visit of Exploration to Waigatz Island.
5. E. Delmar Morgan.—Recent Exploration in Tibet.
6. E. Heawood.—On the Bengal Duars.
7. B. Bentham Dickinson.—The use of the Lantern in Geographical Teaching (with oxy-hydrogen illustrations).

Grants for Scientific Purposes.

The following were awarded for geographical investigations:—

1. Climatology and Hydrography of Tropical Africa, £10.
2. Observations in South Georgia, £50.
3. Exploration in Arabia, £30.

OBITUARY.

Of the members of the Emin Pasha Relief Expedition who have already been removed by death, perhaps none has been more regretted than the late Surgeon-Major Parke. On Sunday, September 10th, when staying at Alt-na-Craig, Ardrishaig, as a guest of the Duke of St. Albans, he was taken suddenly ill, and expired the same evening. His constitution was impaired by the privations he endured in Africa.

Thomas Heazle Parke was the son of William Parke, Esq., J.P., and was born at Clogher House, Drumona, County Roscommon, Ireland, on November 27th, 1857. In 1881 he joined the Army Medical Staff, and since then has spent most of his life in service abroad. He was in the Egyptian campaign of 1882, and received the Queen's Medal and the Khedive's Star. In the following year, when cholera broke out among the troops, he was in charge of the cholera camp at Tel-el-Kebir, where he gave abundant proofs of his ability and devotedness. Subsequently he took part in the Nile campaign for the relief of General Gordon, being present at the actions of Abu-Klea, Gubat, and Metemmeh. Being stationed at Alexandria in 1887, when Mr. Stanley passed through that city on his way to Cairo, Dr. Parke offered his services as doctor to the Emin Pasha Relief Expedition, and three days later set out for Central Africa. The dauntless courage, resolution, and wonderful endurance he displayed during the toilsome march through the forest, when disease and starvation were working havoc among the native porters, and on his return to the fever-stricken camp on the Aruwhimi, are well known to all who have read *In Darkest Africa*; and it will be remembered that he saved the life of Lieutenant Stairs at the risk of his own by sucking the poison from a wound inflicted by a native arrow.

And not only was Dr. Parke endowed with those sterner qualities which contributed so much to the success of the expedition, but his geniality and sincere kindness of heart endeared him to all with whom he came in contact. No better testimony to his worth can be desired than the following letter from Mr. Stanley, written at Belfast on September 14th, which has been sent to us by Mr. A. L. Bruce, who adds that he can indorse every word of it:—

"I was exceedingly shocked to hear of Parke's sudden death, and my thoughts ever since have reverted to the beautiful nature with which he was gifted. A more unobtrusive, modest fellow for a companion one could not wish for. A more skilful and tender nurse for a sick patient there could not be, a more kindly-hearted and genial friend it would be hard to find. He was always so gentlemanly, so considerate and sympathetic, that I always felt that he was a safe man to talk to and reveal my innermost thoughts, sure to be strengthened by his gentle encouragement. He was endowed by nature with a perfectly faultless heart."

"I am rich in memories of friends now—real, good friends, whom to know I consider to have been rare good fortune. But it is a great pity that, beyond images of them as given by the photograph and the fond pictures of them which cling to the memory, I can have nothing more. I

should like to have them in my embrace once again, for only the briefest moment, to tell them of the incalculable amount of love, respect, and reverence I felt for them, and to ask them to forgive and forget the smallest offence, due perhaps to their own imaginings as much as to any temporary infirmity of my own. I would be ineffably happy if that could be. But, alas! it is all useless to wish for such things. All we can do for our dear friends who go from among us, one after another in this way, is to enshrine their best qualities in our hearts, and praise God that we knew such friends, and beg of Him that to those living we may so bear ourselves that when we depart likewise we may leave behind us such proud and glad memories."

Dr. Parke was made a D.C.L. of Durham, received medals from the Royal Geographical Society of London and the British Medical Association, and was awarded the Honorary Fellowship of this Society, besides other honours. Among his writings may be mentioned *My Personal Experiences in Equatorial Africa*, and a *Guide to Health in Africa*, lately published.

GEOGRAPHICAL NOTES.

By W. A. Taylor, M.A., F.R.S.E.,

Librarian, R.S.G.S.

EUROPE.

A Port for Bruges.—In the fourteenth and fifteenth centuries Flanders was the commercial rival of Italy, and Bruges was its chief market. The town then contained 150,000 inhabitants, or three times its present number. During the reign of Charles the Bold, in the latter half of the fifteenth century, considerable alarm was caused by the silting-up of the channel by which vessels approached the town, and at the commencement of the following century numerous projects for the restoration of water communication were discussed. Among these was a plan by Lancelot Blondeel, who proposed to substitute for the Zwin and the port of Sluis a new harbour at Heyst, connected with Bruges by an artificial canal. This scheme, proposed in 1546, was rejected, and an attempt was made to restore the bed of the Zwin between Damme and Sluis; but this measure was insufficient for the needs of the time, and consequently Bruges finally lost its commercial importance. The scheme of Lancelot Blondeel has lately been revived, and the necessary funds, 38 million francs (£1,520,000), have been subscribed by the Belgian Government, the town and province of Bruges, and the engineers, MM. Coiseau and Cousin, who have drawn up the plans.

The basins will be constructed on the north side of Bruges near the basins connected with the Ostend canal. They will be connected with the sea at Heyst by a canal 6¼ miles long, with a breadth of 230 feet at the surface of the water, decreasing to 72 feet at the bottom, and a depth of 26¼ feet. The port of Heyst will be constructed in the open sea, and will be protected by a massive jetty, running out in a north-easterly direction for a distance of 1420 yards, and having a breadth of 59 yards. An opening 200 yards long at the shore end, spanned by an iron bridge, will allow the water to circulate through the harbour. The entrance for vessels

will be on the eastern side, and will have a breadth of 990 yards. The immense jetty will rest on enormous blocks of concrete, each weighing nearly 3000 tons. Boats of concrete will be constructed, which will be towed into position, sunk, and filled.—*Le Mouvement Géogr.*, June 25.

The Former Connections between the Black, Caspian, and Aral Seas.—Herr van Beneden has arrived at some interesting results by comparing the fossil *Cetacea* found in the neighbourhood of these seas. In the basin of the Black Sea are found in a fossil state all the forms which are characteristic of the present ocean fauna—*Balænidæ*, *Ziphioidæ*, *Delphinidæ*, and *Sirenidæ*—and from the districts in which these are found it is apparent that at the end of the Miocene period the Black Sea extended to Vienna, Linz, and even to the Lake of Constance. At this time the three seas formed one sheet of water which was connected, Herr van Beneden affirms, with the Arctic Ocean. Later on, towards the end of the Pliocene, or early in the Quaternary period, through considerable sinking of the land, the Bosporus was formed, the waters of the Mediterranean were admitted, and with them came a new fauna which gradually thrust out the old. Thus oysters and the *Pholas* found their way into the Black Sea, and several fish, among them the anchovy, hitherto strangers in these waters, attained a wide distribution. The Caspian Sea was first isolated, and it now contains fifty-four species of fish which exist neither in the Black nor Aral Sea, while it has only six common to the others.—*Globus* No. 17.

ASIA.

The Survey of India.—The total area surveyed in detail during the year 1891-92 was 80,101 square miles. In addition, traverse operations have been carried on in the Central Provinces to furnish a basis for field surveys under the Settlement Department, and in Bihar in preparation for the Cadastral Survey; the area covered by these operations is 5921 square miles.

The principal triangulation of Upper Burma was continued northwards along the meridian of 96° 30′ from the side Letpataung-Suletaung. Seven figures, extending over a distance of 195 miles and covering an area of 4300 square miles, were completed. A secondary series, starting from the base Letpataung-Suletaung was commenced and carried through Mone eastwards for a distance of 96 miles.

Three parties and two detachments were engaged in topographical surveys in the Bombay Presidency, in Beluchistan and the Himalayas, and in the tin-bearing tracts of the Mergui district, Lower Burma. One detachment was specially organised to survey the districts in the neighbourhood of Aden, a task successfully accomplished in the face of many difficulties. The areas topographically surveyed on various scales amounted in the aggregate to 9909 square miles, as compared with 10,193 miles in the previous year. Geographical surveys were made over 61,162 square miles. Two parties in Upper Burma mapped out 42,078 square miles of country. Captain Jackson, R.E., found an opportunity of exploring the Bret country to the south-west of Karenni, and Mr. Kennedy obtained a large amount of new topographical data in the Hugong valley.—*Report of the Operations of the Survey of India*, 1891-92.

The Indian Marine Survey.—Commander Oldham, who has succeeded Lieutenant Gunn in command of the Marine Survey of India, has sent us the annual *Administration Report*, from which we take the following particulars. Besides the compilation of sailing directories, the staff, when at Poona, completed charts of the coast from the Kistna River to the Sacramento Shoal, of Deogarh Harbour, of

Minikoi Island, and of Musilipatam Roads. The actual survey work included soundings off Dondra Head on the south coast of Ceylon, thus filling up some blanks in the charts, outside the hundred fathom line to the west of Quilon, and between the Lakadivh Islands and Bombay. Other soundings were made over Bassas de Pedro, down to Kiltan Island, and off Chitlac Island, the position of the latter being determined by star observations. Cardamum Island was next surveyed. Deep soundings with a machine of a new pattern, which appears to have been worked with much success, were carried out between Betra Par and Pere Mul Par, in the locality where, as noticed last year, muds supposed to contain pumice were secured. Specimens of the deposits brought up in these later operations were forwarded to the Calcutta Museum for examination. We feel disappointed that no notice is taken of the results of the former tests of these interesting muds. Aukutta was sighted, and the sketches of the locality, made during previous visits, added to. Between Bombay and Colombo over sixty deep soundings were made in depths down to 1200 fathoms. The survey of Mutapolli Bay was a work of great difficulty, taking up much time, as the line of 20 fathoms lies off shore at a distance of 22 miles, and thus requiring a very large number of soundings with the additional work of laying down and afterwards removing many buoys. At the date of the report, work had been carried on up to Pennair.

A number of shoals have been discovered during the season's work, all consisting of sand, on a bottom of sand or sand and mud. These, Commander Oldham conjectures, must have been formed since the previous survey of 1848, and result from the prevailing northerly set depositing the detritus brought down by the rivers, and by the sand and mud stirred up by the strong monsoons and hurricanes. As evidencing the changes in the coast-line, Commander Oldham cites the disappearance of the Pennair beacon, sighted by the survey in 1892, but of which he now failed to find any trace. A further examination of the area also showed that the mouth of the river had been shifted farther to the north from its position when the previous visit was made.

The boat party, under Lieutenant Smith, completed the survey of Bombay Harbour.

Surgeon Alcock having received an appointment at the Sanitary Department of Bengal, the survey has lost the services of an officer who has done most excellent work as a naturalist. From his report we annex a note of soundings as follows :—

Position.	Depth. Fathoms.	Bottom Temperature, Fahr.	Deposit.
Lat. 12° 50′ N., long. 81 30′ E. .	475	49·5	Red brown (terrigenous) ooze.
Lat. 15° 43′ 30″ N., long. 81° 19′ 30 E.	678	42·0	Brown mud, hardening, under pressure, into clay.
About 30 miles S.W. of above. .	753	41·2	,, ,, ,, ,,
Off Armeghon Shoal, . . .	450	. .	Soft.
Lat. 15° 29′ N., long. 72° 41′ E., .	559	47·0	Green mud and shells of Foraminifera.

The Central Himalaya.—Dr. Diener set out in May last from the sanatorium Naini Tal, situated at an elevation of 6350 feet beside a small mountain lake, for the purpose of examining thoroughly the Triassic strata on the Tibetan frontier.

The way of approach to the uninhabited regions of the central range was through Bageswar and Munshiari to Milam, near the sources of the Goriganga. A week's march through the hot confined valleys of the Lower Himalaya, at the southern foot of the Nanda Devi group, and over three passes 5900 to 8500 feet high, brought the expedition to Munshiari, where they entered the highlands of the main range, and in four days' march along the grand gorge of the Goriganga reached Milam. At Laspa (10,000 feet high) the character of the Gori valley changes. From Munshiari up to Laspa it is a narrow defile with steep wooded slopes, whereas above Laspa it widens out and the slopes have a more gentle inclination. At the same time the forests, which clothe the mountains to the south up to a considerable height, disappear, and the slopes to the north are bare even at the same altitude. Wherever isolated woods occur beyond Laspa they are confined to the ravines on the northern side of the ridges, probably because they are here protected from the strong southerly breezes that blow through the greater part of the year. Milam (11,250 feet high) is the highest inhabited place in the Bhot Mahals, the borderland towards Tibet. The inhabitants, who call themselves Rajputs, but are, most of them, of mixed Aryan and Tibetan race, live here from May to October, and carry on an extensive trade with Tibet. Here Dr. Diener remained ten days employed in collecting provisions and beasts of burden, in which he was greatly assisted by the Pundit Kishen Singh, well known as A-K for his explorations in Tibet. He also found time to explore the surrounding country, of which the twin-peaked Nanda Devi, culminating in its western summit at a height of 25,660 feet, is the most imposing feature. The Milam glacier, terminating two miles above the village at an elevation of 11,340 feet, is the largest of the glacial streams that descend from the group and, with a length of 12 miles, is little inferior in extent to the Aletsch glacier. Seen from Milam it appears to end in a fall nearly 6000 feet high, and above this succession *séracs* and hanging sheets of ice rises the lofty Surdzekund peak, more than 23,000 feet in height, a worthy rival of the Matterhorn. Ten tributary glaciers, some of them of great length, descend from the north-east and south-west to join the main stream. In some respects this glacier exhibits marked differences, when compared with those of the Alps. The snow field is small in area compared to the unusually long and narrow streams of ice. The glacier itself has only a slight fall for a distance of four miles, and consequently forms no crevasses of importance. It is also covered so thickly with the rubbish of its moraines that it contrasts but little with the adjoining ground, likewise laden with detritus.

On leaving Milam, Dr. Diener crossed the Utadurrha pass, 17,590 feet high, to the upper extremity of the Girthi valley, and by the Kiangur (17,000 feet) and Kiogarh-Chaldu (17,440 feet) passes reached Hundés on the east, which had never before been geologically explored. Here he ascended four times the summit of Chitichun No. 1 (17,740 feet), the two Chanambaniali peaks (18,320 and 18,360 feet respectively), and, after passing three days amid snowstorms at an elevation of 17,000 feet, succeeded in reaching the top of Kungribingri (19,170 feet). Then, returning by the Kungribingri pass (18,300 feet), he regained Milam on July 30th.

During the five weeks the party were on the journey they never bivouacked at a lower elevation than 14,500 feet, and on eighteen occasions pitched their camp above 16,000 feet. The atmospheric and climatic conditions at these altitudes were great obstacles to scientific work. Dr. Diener did not suffer from mountain sickness, but at elevations above 17,000 feet he was troubled with palpitation of the heart and difficulty in breathing. Strong winds blew almost constantly from the south, and above 15,000 feet the thermometer frequently fell below freezing poin

at night, while in the day the heat in the sun was somewhat high. The lowest temperature recorded was 23° F., on July 27th, at an elevation of 17,000 feet.

The grazing-grounds of Lochambelkichak and Chitichun are one of the most desolate parts of the Tibetan province of Hundés. Even the valley bottoms are nowhere less than 15,900 feet above sea-level, and consequently the vegetation is extremely poor and scanty. Even juniper bushes are rare, and frequently not a single green spot can be seen for miles around. Few peaks rise above the snow limit, which on the Tibetan side is at 18,000 feet above the sea-level, and the relative heights are insufficient to lend grandeur to the scenery.

As the lofty glacier-covered chain between Milam and Lissar proved to be impassable for baggage animals, Dr. Diener and his party determined on setting out again to travel through Rimkin Paiar to Niti. Crossing once more the Utadurrha and Kiangur passes, they reached a Tibetan frontier post at the Laptal grazing-grounds. Skirting the watershed, 17,000 to 18,000 feet high, they at length reached the valley of Rimkin Paiar. On the route were seen large herds of *kiangs* (mountain horses) and sheep (*Ovis Hodgsoni* and *Ovis Burrhel*). Large beasts of prey were never seen, though the spoor of bears and snow leopards was frequently noticed. Two varieties of marmots were very numerous, and a few mountain hares, martins, and black-faced polecats complete the list of small mammals. The birds are principally large birds of prey, ravens, crows, pigeons, snow-partridges (*Lerwa nivicola*) and snow-pheasants (*Tetraogallus Himalayensis*). Eggs of the snow-pheasant were found on Chitichun No. 1 at an altitude of 17,500 feet. The valley of Rimkin Paiar, 13,770 feet above sea-level, is bounded on the south-west by the Kurguthidar chain (20,000 feet), and on the north-west by the pyramid of Marchauk No. 2 (19,518 feet). The neighbourhood is picturesque, and contains species of plants common to the Alps ; the Edelweis, or a very similar variety of *Gnaphalium*, grows here. A few contorted trees, 16 to 20 feet high, were found almost up to 14,000 feet, whereas elsewhere the upper limit of trees in the Himalayas lies between 11 and 12 thousand feet.

Over the Silakank pass (17,800 feet) Dr. Diener came to the source-region of the Dhauliganga, and thence made an excursion to the Niti pass (16,628 feet), the easiest and most frequented route over the watershed of the Central Himalaya, where an insight was obtained into the orography of the highlands drained by the Sutlej, from Hundés to the Kailas range. Traces of glaciation were everywhere visible, old moraines being found in the valley of the Dhauliganga as low as 8200 feet. The village of Niti, the last inhabited place in Garwhal, lies at an altitude of 11,464 feet. Buckwheat and potatoes are grown there.—*Verhandl. der Gesell. für Erdkunde zu Berlin*, No. 6.

Ceylon.—The Colonial Secretary gives a very favourable report on the material progress of Ceylon. The immigration of coolies is a great factor in the increase of population, the excess of immigrants over emigrants in 1891 being 43,170. In the same year there was a marked increase in the railway receipts, and the yield of the pearl fisheries was very considerable (961,541 rupees). The total value of the trade was 125,435,137 rupees, against 114,219,279 in 1890. The principal imports are rice, cotton goods, machines, metals and hardware, and coal. The export of tea rose from 45,799,518 lbs. in 1890 to 67,718,371 lbs. in 1891, while the export of coffee fell off in a still greater ratio. Coco-nuts, oil and arrack, graphite, cinnamon, cinchona and cardamoms are also exported. The shipping shows a constant increase in tonnage and a small diminution in the number of vessels calling at the ports. The railways, which are five in number, with an aggregate extension of 190 miles, paid 6·6 per cent. interest in 1891. The moral state of the people, judg-

ing from the criminal statistics, is improving. The number of serious crimes shows a marked falling off. This is no doubt the result of the spread of education. There are 4052 schools in the island, attended by 153,843 children, 436 being government schools, and 971 receiving support from the Administration.—*Globus*, Bd. lxiii., No. 24.

Burma.—A railway from Mandalay to Kunlon ferry, over the Salween, was proposed by Mr. T. G. Scott six years ago, but, more important undertakings being then in hand, it was set aside. Surveys have, however, been made for the purpose of finding the least costly route, and now a decision has been given in favour of the one through Maymyo, and the course of the line has been laid down as far as Thibaw. The greatest difficulty is the ascent of the Shan plateau, and it is believed that the route chosen is the most desirable in this respect. Maymyo is 3600 feet above the sea, and is only thirty-seven miles from Mandalay. The first thirteen miles is over easy ground to the foot of the hills, after which an ascent of four miles, with a rack line on 8 per cent. of the distance, will carry the railway up to the first plateau, while the gradient on the remaining twenty miles will be one in forty. In the Gokteik gorge a tunnel 500 yards long, and not 1300 as at first anticipated, will be required.—*The Times*, August 23rd.

Upper Burma.—Mr. J. E. Grey has spent several months in the extreme north, and has ascertained that the western branch of the Irrawaddy rises in the range that separates it from the basin of the Lohit river, a tributary of the Brahmaputra. The origin of the other and larger branch, the N'maika, has still to be discovered. Does the Lu river crossed by travellers on the route between China and Tibet become the N'maika or the Salween?—*Colonies and India*, June 10.

POLAR REGIONS.

Dr. Nansen's Polar Expedition.—The secretary of the expedition, who accompanied Dr. Nansen as far as Khabarova, has telegraphed from Vardö an account of his journey. The *Fram* left Vardö on July 21st, and after some detention by fog sighted Goose Land, in Novaia Zemlia, on July 25th. Sailing south-eastwards towards the Yugor Straits, the expedition encountered heavy ice on the 28th, and were very well satisfied with the ship's capabilities of making its way among the floes. On the 29th Khabarova, on the Yugor Straits, was reached, where Trontheim was waiting with thirty-four dogs he had brought from Tiumen, which were found to be excellent for sledge-work. Dr. Nansen went out in his petroleum launch to investigate the condition of the Kara Sea, and returned with the news that there was no ice along the coast. Accordingly, on August 3rd, the *Fram* sailed out of the Straits. On August 6th some Samoyedes saw the vessel proceeding along the coast of Yalmal between the ice and the land.

MISCELLANEOUS.

The *Transactions of the Royal Society of South Australia*, vol. xvi., is devoted to the scientific results of the **Elder Exploring Expedition.**

Captain Monteil is going to the Congo, for the immediate object of regulating the frontier between the French possessions and the Congo State on the Mbome river.

A pamphlet by Mr. Arthur Winslow, State Geologist of Missouri, contains tables showing the **Mineral Production of Missouri** from the commencement of mining operations.

Mr. Israel C. Russell has forwarded a reprint of an article by him, in the *Journal of Geology*, on the **Malaspina Glacier**. It gives a full account of all the glacial phenomena exhibited by the Malaspina.

There now seems no longer room for doubt that **Emin Pasha** has been murdered. Mr. Swan of Ujiji reports that circumstantial accounts of his death have reached him from four different sources. It appears that Emin was killed by an Arab slave-trader in the Manyema country. His diary has been recovered by the Belgian officials at Nyangwe.

O Clima do Rio de Janeiro gives a succinct account of the foundation and work carried on at the **Rio de Janeiro** observatory during the years 1851-1890 under the directorship of L. Cruls. The monthly and diurnal variations in the more prominent elements of climate are discussed at considerable length. A series of diagrams illustrating the above variations adds materially to the interest of the report.

Mr. J. B. Tyrrell, of the Canadian Geological Survey, started from Edmonton, in July last, for an excursion into the **Barren grounds**. His route is far distant from that of Mr. Warburton Pike's, and a great part of the country he will traverse between Lake Athabasca and Hudson's Bay is almost unknown. He expects to reach Chesterfield Inlet, Hudson's Bay this season, and will return thence to Lake Athabasca by a more southerly route.—*Colonies and India*, July 29.

Two members of the Geological Survey of Canada, Messrs. A. P. Low and L. D. Eaton, have left Quebec on an expedition to **Labrador**. They intend to visit Ungava Bay in the extreme north, and Hamilton Inlet on the east. The promoters of a projected railway to Lakes Mistassini and Hudson's Bay are awaiting the report of the expedition to judge of the possibility of bringing the product of the whale fisheries from Hudson's Bay to Quebec by rail.—The *Canadian Gazette*, August 10th.

In the *National Geographic Magazine*, Dr. T. C. Mendenhall describes the triangulation executed by Messrs. Turner and M'Grath for the purposes of determining the height and position of **Mt. Elias**. The lat. obtained is 60° 17′ 35″ N. and the long. 140° 55′ 21·5″ and the mean height is 18,010 feet. Dr. Mendenhall declares that Mount Orizaba in Mexico is, undoubtedly, the highest peak in the continent, its height, as determined by Dr. J. T. Scoville by observations that preclude the possibility of any great error, being 18,314. This vexed question appears then to be at length finally settled.

On April 14th an *Agreement between Great Britain and Germany* was signed at Berlin defining the head of the **Rio del Rey** mentioned in the treaty of 1890, as the point at the north-west end of the island lying to the west of Oron where the waterways Urufian and Ikankan meet. From this point to West Huk, at the mouth of the river, the right bank is to be the boundary between Cameroons and the Oil Rivers Protectorate. The German Administration is not to allow any trade settlements to be erected on the right bank of the Rio del Rey, and the Oil Rivers Administration are to prevent any such settlements from being established on the Bakassey peninsula from the first creek below Arsibon's village to the sea.

A scheme has been drawn up, by Mr. W. S. Bruce, for an expedition under the auspices of the Governor of the Falkland Islands to **South Georgia**. Its scientific objects are to complete the geographical survey of the island, investigate its geology, fauna and flora, and to determine its general climatic conditions by meteorological

observations. It is also proposed to make inquiries regarding seal fisheries, and the possibility of again introducing fur seals, and also to test the capabilities of the island for grazing and agriculture. To carry out this work Mr. Bruce considers that he must remain in South Georgia not less than twelve months, and that one assistant is indispensable, while further help would be desirable. The cost of the expedition is estimated at not less than £400.

NEW BOOKS.

A Bibliography of Morocco, from the Earliest Times to the end of 1891. By Lieut.-Col. Sir R. Lambert Playfair, K.C.M.G., etc., and Dr. Robert Brown, M.A., F.L.S. London: John Murray, 1892. Pp. xviii + 262.

This volume forms the fourth part of *The Bibliography of the Barbary States* in the *Supplementary Papers* of the Royal Geographical Society. Its first author, Sir Lambert Playfair, has been for many years British Consul-General for Algeria and Tunis. He is the author of Murray's *Handbook to the Mediterranean*, and as President of the Geographical Section of the British Association in 1890 he delivered a valuable address on "The Mediterranean, Physical and Historical." The second author is Dr. Robert Brown, the well-known author of *The Peoples of the World*, *The Countries of the World*, and of many other books in which science and literature are skilfully mated. These well-qualified collaborators have done their work very thoroughly, with great knowledge and marvellous industry. The catalogue contains not only every book on Morocco ever written, in any language and in any age, but also references to magazine articles, newspaper articles, and works of general literature in which Morocco is dealt with, or even mentioned. The first entry is for the year 520 B.C., and the last—an extract from a speech of the Marquess of Salisbury—is for 1891 A.D., so that the record covers a period of 2411 years. The last entry is No. 2062; but when we add the public records, State papers, etc., the number of entries is brought up to a grand total of 2243. There is a full index of subjects, a separate index of authors, and an excellent map. The only cause for regret is that the country on whose behalf so much labour has been expended should be described by the authors as "still the most barbarous, the most backward, the most unchanging of all the countries with which we maintain diplomatic relations."

Rulers of India: Aurangzib. By Stanley Lane-Poole, B.A., Author of the *Catalogue of Oriental and Indian Coins in the British Museum*, etc. Oxford: At the Clarendon Press, 1893. Pp. 212. *Price* 2*s.* 6*d.*

When Aurangzib, after a brief but sanguinary struggle with his brothers, made his father a prisoner and established himself as emperor, the Mogul Empire was at the zenith of its prosperity. Elphinstone in his valuable history, after a careful review of all the known facts, gives it as his decided conclusion that the state of India under Shahjahán had been one of great ease and prosperity; and certainly the finances were in good order, for, notwithstanding lavish expenditure on buildings and in other ways, Shahjahán left behind him enormous wealth. But by the close of Aurangzib's long reign the Empire had entered on the course of slow but steady decline which ended in its extinction; the Hindus generally were discontented and disaffected; the valiant Rajputs of Rajputana, who had fought loyally for his predecessors, were alienated and hostile; the Maratha power had grown up and

acquired strength to repel every attack of the Imperial armies; and the public finances were in utter confusion. It is the object of this monograph on Aurangzib to show how this result followed from peculiarities in his character and errors in his policy; how in spite of great ability, steadfast attachment to duty, vigilant superintendence, and unwearied energy, all his plans (to use the words of an admiring Mohammedan historian) came to little good, and every enterprise failed. Mr. Stanley Lane-Poole has described in an introductory note the abundant materials which exist for a study of the character of Aurangzib; but the authority of which he appears to have made most use, and with good reason, is the French physician Bernier (of whose travels an excellent edition, recently published by Mr. Constable, was noticed in this journal for April 1892). In fact, the copiousness and interest of Bernier's narrative have proved rather a temptation to Mr. Lane-Poole. He has found in it the materials for pictures such as those in the chapters devoted to "The Court" and "The Government," which, however interesting in themselves, are rather foreign to the object of the series; instead of which we should have been glad to find mention of any discoverable facts which throw light on the working of the administrative system and the condition of the people throughout the country. That which distinguished Aurangzib from all his predecessors since Bábar, and proved the main source of the misfortunes which overtook the Empire, was his intolerant zeal for the faith and practice of Islam, which led him to adopt irritating and repressive measures against the followers of other creeds. As Bernier says of him that he was "reserved, subtle, and a complete master of the art of dissimulation," the question has been much debated whether he was a politic hypocrite who used religion as a cloak for ambition, or a convinced and devout Muslim in whose soul religious zeal blazed fiercely. Mr. Lane-Poole is an enthusiastic believer in the genuineness and reality of his religious zeal, and at some length supports his view by quotations from trustworthy authorities and by a review of his life and conduct. He compares him to Oliver Cromwell, and too often styles him "the Great Puritan." The comparison seems to us neither apt nor instructive (a much closer parallel would have been found in Philip II. of Spain), and casts rather a stigma on the term Puritan, which cannot fitly be applied to every narrow-minded fanatic of religious temper and rather ascetic life. But, apart from this, the picture of Aurangzib is consistent and satisfying, and in the main probably true. The panegyric on his life of devotion to duty is perhaps too highly coloured; but the reader will gather from the work what sort of man Aurangzib was, and why he failed.

London City Suburbs as they are To-Day. By PERCY FITZGERALD. Illustrated by W. LUKER, Jr., from Original Drawings. London: The Leadenhall Press, Limited, 1893. Pp. xvi+349. *Price* £2, 2*s.*

Mr. Fitzgerald knows his subject well, in many cases intimately, and loves it. Using a facile pen, and commanding a cultivated taste and no little amount of matter-of-fact knowledge, he approves himself an interesting and graceful guide amongst the picturesque beauties of landscape and edifice that are to be found within easy reach of the fiercely beating heart of the great metropolis. He has a discerning and an appreciative eye for colour, variety, quaintness, natural grace, and wildness, and knows how to quicken the individualities of nature with the vivid memories of historic association. He is especially fond of shaping and describing the idiosyncrasy of each suburban district, indicating its peculiar character, architectural or natural, and envisaging, as it were, the general impression it makes upon the thoughtful visitant. But many, we feel sure, will be of opinion that the greatest charms of this in all ways charming book are the soft and

delicately toned illustrations which are scattered with the greatest profusion throughout the pages. The thoroughgoing Londoner would, we imagine, be greatly surprised to find that there are such a great number of "lovely little bits" to be seen so close to his own unobservant eye. But, doubtless, he reserves all his appreciation of natural beauty for places that lie at some distance from his daily residence! These illustrations are beautifully executed, save that a few—but only a very few—in the desire to create an "impressionist" effect, cannot be pronounced altogether free from a certain degree of mistiness or want of firmness. The selection of "bits" has been on the whole made with admirable skill and taste; there are barely half-a-dozen that one feels to be out of place amongst their brethren. But we cannot help thinking that several of them might have been placed in closer proximity to the text they serve to illustrate. Chapter v. is surely inappropriately named. Harrow and Willesden cannot by any feat of geographical conjuring be said to lie north-east of London. The book is excellently printed and bound, and is equipped with a full index, besides a list of original subscribers to the work.

Recollections of an Egyptian Princess. By her English Governess. New Edition. Edinburgh and London: Wm. Blackwood and Sons, 1893. Pp. 376.

Whatever were the faults of the Khedive Ismail, he provided excellent instructors for his children. Miss Chennells, the authoress of this interesting volume, was governess to his daughter, the Princess Zeyneb, from 1871 to the Princess' death in 1875. "The Khedive, to do him justice, was anxious to raise the position of women; he founded schools for girls, he endeavoured to promote education in his own harem, and gave much greater liberty and means both of recreation and instruction to its inmates than any sovereign had done before him." However, "the Princess Zeyneb was the only instance of a daughter brought up outside the harem." She had an Armenian physician, Zohrab Bey, who had studied medicine at Aberdeen University, "was an enthusiastic admirer of Burns and Scott, and spoke English without the slightest foreign accent; rather like an educated Scotsman."

For an insight into the curious details of the harem, with its multitude of slaves, its joys and its sorrows, such a book as this, written by an eye-witness, is, of course, invaluable. One of the most memorable events that ever occurred in a harem was when the Princess Zeyneb was photographed. The danger in employing a European was that her photograph might be sold, "and that would violate all ideas of Oriental propriety;" so an Arab photographer was engaged, and as he could not be admitted into the harem, the Princess was photographed in the outer garden, several eunuchs standing by.

When the charming Princess died, at the age of sixteen, her father was stunned by the blow. "She was the light of my eyes," he exclaimed. "She had a better influence over me than any one else; and that I ascribe entirely to the excellent English training she had for so many years." The loss sustained by the Mohammedan women of Egypt by the death of the estimable and cultured Princess cannot be over-estimated, for, had she lived, she would doubtless have furnished them with an example which they might follow of a princess educated outside the harem.

Our Sentimental Journey through France and Italy. By Joseph and Elizabeth Robins Pennell. New Edition. London: T. Fisher Unwin, 1893. Pp. 255.

After invoking the ghost of Laurence Sterne, these playful Americans, Mr. and Mrs. Pennell, tell us how they travelled through France on a tandem tricycle.

Exquisite little etchings by Mr. Pennell give piquancy to the pages of the elegant volume before us, wherein his wife describes in a charming way the pleasures and vicissitudes of their extraordinary journey. At Calais (where they started) their tandem was taken possession of by the French custom-house officers, was weighed, its wheels measured, and its number taken, and our travellers were made to deposit fifty francs (£2), three-fourths of which sum would be returned if they carried the machine out of France within three months, "the remaining fourth going to pay the Government for (the machine's) wear and tear of French roads."

Our travellers pushed on from Calais to Modane (on the French side of the Mont Cenis tunnel) where, apparently, they stopped, so that the title-page is rather out in adding the words "and Italy." However, an excellent French tour is described in excellent Sterne-like English, and the illustrations of themselves make the book worth having. One word in conclusion. "There is only one portion" of France, says Mrs. Pennell, "which every one who cares for the pleasures of cycling should be advised to avoid, and that is the vast and dreary plain stretching from Paris to Le Mans, and from Rouen to Orleans."

Letters from a Mahratta Camp during the Year 1809. By THOMAS DUER BROUGHTON. A New Edition, with an Introduction by the Right Hon. Sir M. E. Grant Duff, G.C.S.I., F.R.S. Illustrations, Map, and Index. London: Archibald Constable and Co., 1892. 8vo. Pp. xxxi + 273. *Price* 6*s*.

In these days when the globe-trotter who happens to take India on his way thinks it necessary to give his crude and hastily formed ideas to the public in a work with some such title as *A Six Weeks' Scamper across Hindustan*, it is refreshing, to an "old Indian" especially, to meet with a book by some one who really knows what he is writing about. The impression left on the mind after reading these letters is that they are thoroughly truthful, and that they give a faithful description of the manners, customs, and characters of the people with whom the author came in contact in Sindhia's camp. The account of the different festivals, Hindu and Mohammedan, is particularly interesting. The illustrations are quaint, and give a good idea of the scenes and persons they represent. The index, and map of the author's route from Agra to Ajmere, will be found very useful by the reader.

Reminiscences of Australian Early Life. By A PIONEER. Illustrated by HUME NISBET. London: A. P. Marsden, 1893. Pp. xii + 245.

This interesting and instructive narrative is plainly and fluently set forth in a style very suitable for the subject, an evident striving against exaggeration and an absence of fine writing being conspicuous—merits too frequently missing from works on colonial experiences. The author did a good deal in opening up an unknown country for settlement, had some exciting adventures with the Blacks, noted with the eye of a keen observer the progress and results of the great gold rush, and experienced the oppression of the bushrangers. On all these heads, as well as on such subjects as convicts, the early police force, squatting, selecting, and speculating, he has shrewd remarks to make, or amusing or illustrative anecdotes to tell. His pages vividly show a former state of the country, hard now to realise, and gone never to return. We have to thank the "Pioneer" for the interesting and valuable work he has successfully accomplished. We are disappointed with the illustrations. Mr. Hume Nisbet has done, and can do, much better than in the pictures before us, in several of which the human figure is badly drawn, and in one case the want of perspective is very striking.

Abroad and at Home. Practical Hints for Tourists. By MORRIS PHILLIPS. New York: Brentano's, N.D. Pp. 365.

This book may be divided into two parts, of which the first is not so much a guidebook as a volume designed to make the intending American traveller in Europe familiar with the manners and customs of the strangers among whom he is to sojourn, and to tell him what hotels are best suited for his residence. This has all been well done. We are glad to note that the civility met with by the tourist in Britain has been appreciatively noticed by the author. Certain objects of interest are also pointed out, but the selection seems peculiar: for instance, under Edinburgh, the india-rubber pavement in Princes Street is noticed, but there is no mention of St. Giles' Church or St. Mary's Cathedral, and the description of Glasgow University comes in between the india-rubber pavement aforesaid and the Edinburgh Café. The second part of the volume contains brief descriptions of most of the popular resorts in the United States, with advice regarding the different hotels, of which, by the way, Mr. Phillips appears to have had a large experience in his time, and may therefore be accepted as a trustworthy guide. This division of the book ought to prove useful to the British visitor to the United States.

The Chronicles of the Sid; or, the Life and Travels of Adelia Gatis. By ADELA E. ORPEN. London: The Religious Tract Society, 1893. Pp. 413. *Price 7s. 6d.*

This is a record of the rather remarkable life of an elderly American lady, who, "though a simple, an unpretentious, and a poor woman," managed to see a good deal of the world. A factory girl in her youth and subsequently a teacher, she came to the Paris Exhibition in 1867. Thence she visited Italy, and wandered in the Sahara Desert, where she got her title of "Sid," or "Lady," from the Arabs. She subsequently went up the Nile, travelled in the Holy Land, and visited Norway and Iceland. Her journeys show how much of the world may be seen by a woman of determination, in a quiet way, and with comparatively small expense. The book is written by a fervent admirer, with a good deal of gush, and is illustrated with Oriental cuts which we fancy have done duty before.

How the Codex was Found: A Narrative of Two Visits to Sinai; from Mrs. Lewis's Journals, 1892-1893. By MARGARET D. GIBSON. Cambridge: Macmillan and Bowes, 1893. Pp. 141.

The title well describes the character of this modest volume: the reader not specially interested in the ancient Codex of Syriac Gospels is not much troubled with it. The narrative is about the visits made by the two sisters and their experiences at Sinai, and on the way thither and back. Englishwomen do not travel every day in that peninsula, and their experiences are brightly told. The Codex, and their work in copying it by photography, occupy a small part of the book; a chapter is devoted to a (translated) Greek description of Sinai from Perikles Gregoriados; and another to St. Sylvia of Aquitaine, who visited Sinai about 386 A.D., and describes the scenery a century before the present monastery was built there: a long extract from the diary of this female pilgrim of the fourth century is of interest. As a book of travel this is a very readable little volume.

History of Clare and the Dalcassian Clans of Tipperary, Limerick, and Galway. With an Ancient and a Modern Map. By the Very Rev. P. WHITE, P.P., V.G. Dublin: M. H. Gill and Son, 1893. Pp. xvi + 398.

Mr. P. White's *History of Clare* is written from the Irish Nationalist and

parish priest point of view, the author's sympathies being shown most strongly in connection with the events of the last forty years, with which he has in various ways been mixed up. These political and controversial matters are altogether outside of the sphere of a geographical magazine. The geographical sections of the book, and those that refer to the early races that occupied Clare, are interesting; but the information is too meagre to be satisfactory. The two maps have a distinct value. The one shows the county of Clare and its parishes as they are at the present time. The other shows the ancient divisions superimposed on the modern map, so as to show the corresponding portions. The author appeals to critics to be merciful to him on account of the disadvantages under which his book has been written. The literary quality of the book is not high; but no one can read it without feeling that it is characterised by a certain rugged force which comes from strength of feeling, earnestness of conviction, and love of the subject.

Old-World Scotland: Glimpses of its Modes and Manners. By T. F. Henderson. London: T. Fisher Unwin, 1893. Pp. 263.

This is a collection in one volume of a series of essays contributed to the pages of *The National Observer*, with one or two additions. The matters with which they deal may be inferred from the titles of the papers, "On Wine and Ale" (which treats also of the growth and development of the taste for usquebaugh); "In Praise of the Horn Spoon;" "Vagabonds and Minstrels;" "Kirk Discipline;" "Assassination," etc. In "New Light on the Darnley Murder," Mr. Henderson seeks to prove conclusively the motives which made Mary consent to act as Bothwell's confederate. There is much to interest in the book, which is written in a pleasant and facile manner.

Classified Digest of the Records of the Society for the Propagation of the Gospel in Foreign Parts, 1701-1892. With much Supplementary Information. London: At the Society's Office, 1893. Pp. 980.

This carefully compiled and laboriously edited volume is a contribution of considerable value to the history and geography of the Missions of the Reformed Churches. To the supporters of the venerable Society whose annals it condenses so well the volume is invaluable. The compiler, Mr. C. F. Pascoe, has spent all his leisure on the work for five years. The S.P.G., as it is popularly called, representing the 'High' division of the Church of England, is the fourth, in point of time, on the list of British missionary organisations. Cromwell's New England Company (1649) is first, and Boyle's Faith Society (1691) is second, both having now but small results to show. The Society for Promoting Christian Knowledge (1698) comes next, because it greatly helped the early missions to India, though now it is almost purely a publishing concern. The Gospel Propagation Society (1701) did not become missionary in the 'foreign' sense of the word till 1821, but up till that time, and since, it has cared for the English-speaking 'dispersion' in America and in all parts of the world to which it has procured the appointment of bishops and chaplains. In a clear and terse style the writer traces the work of the Society during the past 192 years in no fewer than ninety countries and colonies, and appends to each an accurate summary of its geography and statistics. We have carefully consulted the chapters devoted to Asia and the East, and have found them most useful, the facts being brought down to the close of 1892. A detailed index completes the value of the book as a work of reference.

An Introduction to the Study of Geography. By William Hughes, F.R.G.S., and J. Francon Williams, F.R.G.S. London: George Philip and Son, 1893. Pp. 100. *Price* 1*s.*

This is the introductory chapter of the *Advanced Class-Book of Modern Geography*, by Messrs. Hughes and Williams. It deals with mathematical, physical, and commercial geography in a very thorough manner. The authors profess also to deal with political geography; but they do so to a very limited extent. The book will be extremely useful in secondary schools and training colleges.

Home Geography of England and Wales. By G. Phillips Bevan, F.G.S., F.S.S., etc. With 12 Coloured Double-page Maps. London: Swan Sonnenschein and Co., 1893. Pp. vi + 248. *Price* 4*s.* 6*d.*

The author does not explain the significance of the word "Home" in his title, and the reader is left in doubt whether it is meant to describe the book as one to be used at home, or as one dealing with the home country. In either case, the book may be commended as a sensible and readable description of the counties of England and Wales. Each county is taken up separately, Kent standing first as the bulwark or outpost county. Something is said of its history, and of the physical changes it has undergone. Its surface, its rivers, its railways, its industries, and its cities and towns are then dealt with in separate paragraphs, the whole being written in a pleasant style, without repulsive tables of names and figures or uninteresting details. Mr. Bevan's English is not so good as his geography. He says that Shakespeare's house "contains a museum of everything connected with Shakespeare's life or writings"—surely a rather large order. He describes the Memorial Theatre at Stratford as "a modern building to commemorate his life by acting his plays at stated intervals"—which makes the building the actor. Any one may see what the author means; but why does he not say what he means? There is slipshod English of that kind in nearly every chapter.

An Elementary Geography of British South Africa. By Lionel W. Lyde, M.A. London: Percival and Co. Pp. 84. *Price* 1*s.*

Mr. Lyde has added a text-book on British South Africa to his excellent series of elementary geographies. The subject is treated in the same clear, concise, and interesting way as in the previous books. Cape Colony and Natal are described with more detail than the other divisions, separate chapters being devoted to "Surroundings," "Surface," "Vegetation," "Minerals," and "Divisions." The method is descriptive throughout. There are no lists of names to be committed to memory. The author appeals to the intelligence and the imagination of his readers. The physical basis of the whole treatment is prominent in every chapter.

Palestine: its Historical Geography. With Topographical Index and Maps. By Rev. Archibald Henderson, D.D. Second Edition, Revised. Edinburgh: T. and T. Clark, 1893. Pp. 227. *Price* 2*s.* 6*d.*

We are glad to see that the value of this work has been so far recognised as to permit of its author putting forth a second edition. The first was a very useful manual—really the only text-book in English (except Conder's much briefer *Primer*) which could be used by a class. Dr. Henderson had the advantage of travel in the land: he had proved his mastery of its features by some contributions to its topography. He was familiar with the English literature on the subject, and Major Conder supplied him with maps. This edition has been thoroughly revised: the ten years' work on the country that has taken place since the first was published has been

noted; reference have been made to the Revised Version of the Bible; and in the Appendix additional information has been provided on the history of the land before its conquest by Israel, and on the site of "Acra." There is also given Professor Neubauer's translation of the Moabite Stone. We wish that Dr. Henderson had taken advantage of his opportunity to revise the section on the Wars of the Maccabees, and provide English readers for the first time with a satisfactory index to the places and campaigns of that period.

Dr. Henderson's method is historical—that is, he treats the places under each period in which they were famous. This is bound to interfere with the reader gaining a full impression of the appearance and full historical value of any site, but it is probably the best way to teach Biblical geography, which is the author's chief intention. He does not pass beyond New Testament times—except incidentally.

There are some points on which it would have been well to express the alternative opinions, and a few others in which we think Dr. Henderson has far from sufficient ground for his own. In spite of Dr. Sayce and some Egyptologists, Caphtor has not been proved to be the Nile delta. It is certainly outside Egypt (Amos ix. 8), and the bulk of the evidence goes with the opinion which most Biblical scholars now hold, that it was Crete. We miss any attempt to explain the differences between the two accounts of the conquest in Joshua and Judges. Probably the author believes that there is nothing in the theory of Oort, Stade and many Germans, that the tribe Judah invaded the land, not from the east of Jordan, but from the Negeb—or that it is beyond the scope of a Handbook. We cannot agree with his identification of Etam with Beit 'Ata: this lies too high for the statement that Samson *went down* to it. In all the topography of that part Schick's paper in the *Zeitschrift des Deutschen Palästina Vereins*, vol. x., should be consulted. That Taricheae lay at the south end of the Lake of Galilee is uncertain enough for the other view to have been stated. There is a misprint on page 108: 'Josh.' should be 'Judges.'

These are small defects in a fine piece of work, by one who knows his subject. We trust that this Handbook will become even more widely known through its second edition. The teacher and the student of the Bible will find it of very great value.

The French War and the Revolution. By William Milligan Sloane, Ph.D., L.H.D., Professor in Princeton University. With Maps. London: Sampson Low, Marston, and Co., 1893. Pp. xxii + 409. *Price* 7*s.* 6*d.*

This book is the second of the series of four volumes, by different authors, which are together to form a connected history of the United States. The first volume, treating of *The Colonial Era*, and written by Professor Fisher of Yale, was noticed in the February number of this magazine. In style and method of treatment Professor Sloane's book bears a strong resemblance to that of Dr. Fisher. It is simple, direct, and unimpassioned. The author has made it his first aim to reach the actual facts in connection with every incident and transaction, and he has not striven after picturesque writing, which always tends to subordinate actuality to effect. Take, for example, his description of the decisive battle on the Plains of Abraham: it is narrated in businesslike, matter-of-fact style, without the adornments of rhetoric; unless, indeed, the inevitable story of Wolfe's quotation from Gray's *Elegy* may be included in that category. Or take, again, the description of the Battle of Bunker Hill: that also is a piece of naked realism, which exhibits the author in a state of commendable self-restraint. He deserves credit, too, for his manifest effort to present only the great and outstanding features of the history, and to avoid the ever-present temptation to elaborate details.

The period covered by the present volume is one of great and enduring interest. It extends, broadly, from the Treaty of Aix-la-Chapelle in 1748 to the Treaty of Paris and Versailles in 1783. But it embraces two distinct sections of very different character. In the earlier section, the struggle in America is a colonial incident of the Seven Years' War in Europe, in which the American colonies of Great Britain side with the mother-country against France. In the later, the colonists are in conflict with the mother-country in their struggle for independence, and reckon France their most powerful ally. Perhaps the greatest merit of Professor Sloane's volume is that it demonstrates the evolution of a new theory of government developed by the later conflict, in which the essential relations of taxation and representation are set forth with great clearness and force.

British Forest Trees and their Sylvicultural Characteristics and Treatment. By John Nisbet, D.Œc., of the Indian Forest Service. London: Macmillan and Co., 1893. Pp. xvi + 352.

The first 54 pages are devoted to a historical sketch of British forest trees, with a concise exposition of the main facts relating to forest soil and the growth of forest crops, followed by a discussion of the comparative requirements of the several species in the way of climate and soil, their shape, growth in height, girth, volume, and their reproductive power and longevity. The remainder of the book consists of a series of notes on each of the principal species, including their chief characteristics and requirements, the liability to suffer from external dangers and from disease, their proper sylvicultural treatment, and the various methods of raising them in forests. The work, which is to a considerable extent a compilation from the writings of the best German authors, forms a most valuable addition to our scanty literature on this important and interesting subject. Of the matter of the book we have nothing but praise to record; but its usefulness as a book of reference would have been much enhanced if the various subdivisions had been headed by more conspicuous type, and if, instead of printing the title at the top of every page, alternate pages had shown the subdivisions to which the lines below them relate. For instance, it is difficult to find even the 28 pages relating to the Scotch fir without referring to the index.

Handy Book of the Tides, with fifteen Charts showing the state of the Tide at every hour at Dover. Compiled from various sources by W. B. Whall. 4th Edition. London: George Philip and Son, n.d. Oblong 4to. *Price* 3*s.* 6*d.*

We must protest against the habit of suppressing the dates on title or to preface that is too much the practice nowadays in publications for which the date is of importance.

Mr. Whall, in 10 pages of remarks and 15 outline charts, gives a good deal of practical information that must be of use to the seamen afloat as showing at a glance the hang of the tide on our shores and in the North Sea for every hour before or after high-water at Dover. All scientific knowledge of the subject is discounted: "Tideology is not one of the *exact* sciences;" why then should we trouble about Euler or Laplace, Young or Whewell or Lubbock's theories, and differing values of the constants? We need not disparage them, however; they all knew that their information only served to afford approximations, which practical men by careful observations might furnish the means of rendering practically exact, so far as the tides themselves are concerned.

Nederlandsch Oost-Indie. Beschreven en afgebeeld voor het Nederlandsche Volk door P. A. VAN DER LITH. Afl. 6 and 7. Leiden: E. J. Brill, 1893.

A notice of the earlier numbers of this work was published on page 391. The present parts deal with the Hindus in Java, Celebes, and the Moluccas, and maintain the same high standard of thoroughness.

Canoeing with Sail and Paddle. By J. D. HAYWARD, M.D. London: George Bell and Sons, 1893. Pp. x + 152. *Price* 2*s.*

Dr. John D. Hayward's book on canoeing is a very nice little manual, full of useful hints as to the management of canoes either with paddle or under sail.

It also contains suggestions for camping-out or other trips, informing one of all precautions that ought to be taken with reference to the seaworthiness of the canoe before starting. We confidently recommend the work to canoeists, more especially to the novice in this branch of nautical sport.

The information with regard to what is absolutely necessary to take with you on a canoe cruise is invaluable. We can only recommend that nothing should be taken that Dr. Hayward does not mention, as in those tiny craft space is very limited.

Guide to Health in Africa. By Surgeon-Major T. H. PARKE. With Preface by H. M. STANLEY. London: Sampson Low, Marston, and Co., 1893. Pp. 169 and Index. *Price* 5*s.*

Anything from the pen of Surgeon-Major Parke will be read with interest, and we can cordially recommend this guide to health to all who propose to travel or reside in Africa. After giving a very brief but readable account of the African continent, its climate and meteorology, its inhabitants and the fauna and flora, he details the various diseases by which the traveller is likely to be attacked, and describes their treatment in simple language. A list of drugs, etc., which should be taken to Africa is given. There is only one criticism which need be made, and that is with reference to the prolonged administration of quinine with the object of warding off malaria. Dr. Parke says that five grains of bisulphate of quinine should be given three or four times a day. This we believe to be far too large a dose, five grains a day being sufficient.

Some Legendary Landmarks of Africa. By Mrs. FRANK EVANS. London: Cassell and Co., Limited, 1893. Pp. 118. *Price* 8*s.* 6*d.*

Mrs. Frank Evans has collected various legends from South Africa and has woven them into four stories of the fairy type. They are extremely interesting, and give a vivid idea of the beliefs and superstitions of the natives. They do not lend themselves to a detailed review, but they are well done, and will be of great value to all interested in folk-lore.

Bihé and Garenganze: A Record of Four Years' Work and Journeying in Central Africa. By F. S. ARNOT. London: J. E. Hawkins and Co., Limited, 1893. Pp. 148. Maps and Illustrations. *Price* 2*s.* 6*d.*

This volume is a collection of missionary letters which have been written by Mr. Arnot and members of his mission party between Bihé and Garenganze, practically giving an account of the mission work, adventures, and experiences from March 1889 to July 1892. Although this is not a geographical book, yet it contains a good deal of interesting information, not only of a geographical nature, but also on the habits and customs of the natives. All interested in African missions will welcome it.

Brehms Tierleben. Allgemeine Kunde des Tierreichs. Dritte, gänzlich neubearbeitete Auflage, herausgegeben von Prof. Dr. Pechuel-Loesche. Bd. iv., pp. xiv + 770; Bd. v., pp. xiv + 713; Bd. vi., pp. 740. Plates, Illustrations, and Maps. Leipzig und Wien: Bibliographisches Institut, 1891 and 1892.

In a review of the first three volumes of this great work we took occasion to refer to the place which it occupies in the literature of Natural History, and to the excellence of this new edition. The second three volumes deal with birds, of which Brehm spoke with special authority and enthusiasm; and, like the others, have been re-edited by Dr. Pechuel-Loesche and Dr. W. Haacke. As the original book has long since been judged and awarded a justly high place, we need not do more than say that its value has grown in the hands of the editors, and that the number of beautiful illustrations has been increased. The characteristic value of the work consists in the prominence that is given to the actual life and habits of animals in their native haunts, and this is a quality which commends it not to zoologists only, but to all who are interested in animal life.

Brehm's Merveilles de la Nature: La Terre, les Mers, et les Continents. Par Fernand Priem. Fasc. 2. Paris: J. B. Baillière et Fils, 1893.

A large part of the present fasciculus of Brehm's *Merveilles de la Nature*, pp. 185-320, is devoted to the subject of Volcanic Phenomena and Earthquakes and their attendant phenomena. Then follow several pages relating to the Deluge; 19 pages are devoted to the subject of changes of level; and the remainder of the part at present before us treats chiefly of great earth-movements, such as overthrusts, faults, and allied dislocations. It is illustrated by over two hundred woodcuts of "marvels," which, though by no means well chosen, and in but few cases of much scientific value, yet serve, more or less, the purpose for which they evidently were intended.

Guide to Ireland. London: Adam and Charles Black, 1893. Pp. 150. *Price* 1*s.*

Messrs. Black publish a larger guide to Ireland, but probably the ordinary tourist will find this "cheap edition" sufficient. Excellent maps accompany it, and the only information which seems wanting is as to the population of Ireland and its various towns. When we reflect that between 1841 and 1891 the population of Ireland has decreased nearly 45 per cent., and is still decreasing, the question becomes one of considerable importance.

Guide to the Watering-places of Kent, also Hastings, St. Leonards, Winchelsea, and Rye. London: Adam and Charles Black, 1893. Pp. 63. *Price* 1*s.*

This is only a fragment of a larger guide, and has no index. It has a good map of Kent and various plans of towns. Battle Abbey is dismissed very summarily, considering that it is the chief excursion from Hastings; and St. Leonard's occurs only on the title-page.

The Illustrated Guide to Cambridge and Neighbourhood. By A Resident Trinity M.A. Fourth Edition. London: Jarrold and Sons, n.d. Pp. 143.

The visitor to Cambridge will find this a very useful guide. It contains sketches of the history of the University and Colleges, and sufficient information regarding the buildings most worth seeing, in a handy form. One or two details might be added, but they are not of much interest to those who are not intimately acquainted with the University. It is, however, an interesting fact that the convey-

ance of the water to the fountain in Trinity College is, as far as is known, the first application in England of the principle that water rises to its original level. Very little is said about the "neighbourhood," and it is very singular that Ely is not even mentioned.

Shakespeare's Land. By C. J. Ribton-Turner. With Thirteen Maps and Plates. Leamington: Frank Glover, B.A., *Courier* Office; London: Simpkin Marshall, Hamilton, Kent, and Co., 1893. Pp. 416. *Price* 7*s.* 6*d.*

Shakespeare's Land is the somewhat romantic title given by Mr. Ribton-Turner to his carefully compiled guidebook of Central and Southern Warwickshire. It contains, besides much accurate information valuable to the ordinary tourist, histories and descriptions of the many old mansions and churches of the district. Shakespeare's birthplace and all the surroundings of the poet at Stratford-on-Avon are so fully described as to satisfy the most exacting pilgrim to this shrine. The book is furnished with maps by Mr. Bartholomew of Edinburgh, including interesting ground-plans of Leamington, Warwick, and Stratford-on-Avon. The book will be a great acquisition to all who wend their steps to the leafy lanes of Warwickshire.

Spa and its Environs. By Jean d'Ardenne (Léon Dommartin). "Illustrated Europe," Nos. 148-50. Zürich: Füssli, 1893. Pp. 80. *Price* 1*s.* 6*d.*

In this beautifully illustrated guide the visitor will find, in concise but accurate terms, everything worth knowing or seeing about Spa, a town so celebrated for its mineral springs that the term "Spa" has become applicable to any place where there is a frequented mineral spring.

Guidebook to Alaska and the North-West Coast. By Eliza Ruhamah Scidmore. London: Wm. Heinemann, 1893. Pp. 151. *Price* 6*s.*

The authoress may be congratulated on a very thorough piece of work, the "Books of Reference" which she cites alone extending to 3½ pages. The book is printed in America, and is well illustrated. Pole Brothers, Chicago, are the engravers of a large map showing "the route of the Alaska excursion steamers" from Tacoma to Chilcat.

Barrett's Illustrated Guides: Eastern Counties. No. 1, Round Southwold, 6*d.*; No. 2, Round Aldeburgh, 6*d.*; No. 3, St. Osyth (Wivenhoe, etc.), 6*d.*; No. 4, Southend (Leigh, etc.), 6*d.*; No. 5, Round Ipswich, 6*d.*; No. 7, St. Osyth Priory, 3*d.*; No. 8, Caister Castle, 3*d.*; No. 9, Colchester and Lexden. London: Lawrence and Bullen, 1893.

These little books, of about 50 pages each, are intended to inform the visitor what of archæological and historical interest there is to be seen in the place at which he is staying, or in its vicinity. Beyond an extract from the time-tables of the Great Eastern Railway, there is little information of immediately practical value; but an abundance of what relates to the old churches, families, mansions, and ruins, all conveyed in a pleasant, easy style, and illustrated by numerous very creditable woodcuts.

The Adula Alps. By W. A. Coolidge. Pp. 192.—*The Mountains of Cogne.* By George Yeld and W. A. Coolidge. Pp. 176. London: T. Fisher Unwin, 1893.

The former of these guides describes the ranges between the St. Gotthard route on the west and the Splügen Pass on the east, the northern boundary being formed

by the Oberalp route from Andermatt to Chur, a district offering no great attractions to the enthusiastic climber. The other deals with the Eastern Graian Alps, lying in Italian territory. Here the bouquetin (*Capra Ibex*) still survives. *Conway and Coolidge's Climbers' Guides* are so well known and appreciated that it is only necessary to announce the publication of these two volumes.

A Guide to Whitby. Whitby: Horne and Son, 1893. Pp. 135.

This is a compact and neat little guide to one of the most popular watering-places in the North of England, giving the visitor some information upon nearly all the chief points of interest in connection with the place. The volume contains some maps, as well as several illustrations—mostly process-blocks from photographs. More than a guidebook it does not profess to be, but as such it is good.

London. Illustrated by Twenty Bird's-Eye Views of the Principal Streets, and by a Street Map of Central London. Originally compiled by the late Herbert Fry. London: W. H. Allen and Co., Limited, 1883. Pp. xviii+252. *Price* 1*s.*

We have so frequently and favourably noticed this handbook as one of the best guides that a stranger in the metropolis can provide himself with, that we need do little more than announce the appearance of a new edition. It is full and accurate as ever, and has been brought down to date.

Quiet Old Glasgow: Its Latter Days before Railways. By A Burgess of Glasgow. Glasgow: Robert Lindsay and Co., 1893. Pp. 57.

The author, now, as we understand, in his eighty-fourth year, can go back in memory to 1816, and his descriptions of what is now the second city in the Empire in the years following the battle of Waterloo are interesting and most instructive. Stockwell Street and neighbourhood was then the fashionable quarter, and burgesses used, on summer evenings, to enjoy a walk to the village of Grahamston, situated between the then West End and Anderston. Nothing can better illustrate the wonderful growth of Glasgow than this plain, unpretentious narrative, which we have followed with deep interest.

Illustrated Guide to Perthshire. By Thomas Hunter. Perth: Thomas Hunter, n.d. Pp. ix+228. *Price* 1*s.*

The new edition of this well-known *Guide* has been brought carefully up to date, and is embellished with numerous illustrations and maps, several of which have not previously appeared in the handbook. The volume is an indispensable companion to any one visiting the most beautiful, and one of the most interesting of our Highland counties. A good index is a useful feature, and the full information regarding the sport afforded by rivers, lochs, and burns should prove of the greatest advantage to anglers.

Collins' Guide to London and Neighbourhood. With Maps and numerous Original Illustrations. New Edition, Revised and Improved. London: William Collins, Sons, and Company, Limited, n.d. Pp. 200. *Price* 1*s.*

To those whose aim is to see as many sights as possible within a limited period, and who are not particular to inquire very minutely into the historical associations

of the various places described, this neat little pocket volume may be recommended. It is excellently planned and plainly and succinctly compiled, while the illustrations and maps are sufficiently well executed for their purpose. The lists of hotels, theatres, churches, railway stations, etc., are fairly complete. The arrangement of the names in alphabetical order does away with the need of an index.

Mackenzie's Guide to Inverness: Historical, Descriptive, and Pictorial. With Excursions. By ALEXANDER MACKENZIE, M.J.I. Inverness: A. and W. Mackenzie, N.D. Pp. 118. *Price* 1*s.*

This is an excellent and brightly written guide to the capital of the Highlands, which will be found useful to all visitors, and necessary to strangers wishing to take an intelligent interest in what they see in the town and the surrounding country. It is fairly well illustrated, but map and index are alike lacking.

Handbook to the Highland Railway, West Coast, Orkney Islands, etc., Season 1893. Twelfth Edition, Revised and Enlarged. Inverness: *Northern Chronicle* Office. Pp. 223 + 27. *Price* 1*s.*

We welcome this indispensable companion for travellers and tourists on the Highland Railway and its connections. A better book for the purpose it is intended to serve could hardly be imagined. The illustrations are numerous and well executed, and there is a complete and detailed index. Altogether an excellent little volume.

The Settler's Guide to New Zealand. Compiled expressly for the New Zealand Shipping Company (Limited). By E. L. BENTLEY. London: Waterlow and Sons, 1893. Pp. 70. *Price* 6*d.*

The intending settler in New Zealand may here pick up some useful information concerning his voyage in the boats of the Company in the interests of which this little manual has been compiled. To men with a small capital of £100 or over, looking for a cheap passage, the book may be recommended; but beyond the help thus given they need look for but small assistance from a perusal of its pages, as the space devoted to most of the matters treated of is totally inadequate.

The International Guide to the World's Columbian Exposition to be held at Chicago, U.S.A., May to October 1893. London: The International Guide Syndicate. Pp. 192. *Price* 1*s.*

The intending visitor to the Chicago Exhibition will here find a considerable amount of information connected with the exhibition itself, the buildings, grounds, etc. But the matter relating to other places to be visited, being drawn up on the American plan, is hardly suitable for British tourists, who generally desire fuller details than are given here. For instance, Boston is dismissed in about three-quarters of a page. Neverthless, there are many useful little items included, with a chapter giving medical advice. It ought to be added that the paging given above includes many advertisements.

Facts and Figures about Ireland. By THOMAS WRIGLEY GRIMSHAW, M.A., M.D., Registrar-General for Ireland. Part I. Dublin: Hodges, Figgis, and Co., Ltd.; London: Simpkin, Marshall, Hamilton, Kent, and Co., Ltd., 1893. Pp. 59. *Price* 1*s.*

With only the first part of this treatise before us, we can but say that Dr. Grimshaw's compilation gives promise of being a very valuable work, likely to be

of considerable utility at the present time, although much will depend upon its scope. We would suggest that the statistical tables be presented in graphic form in an appendix.

The Case for the Armenians. With an Introduction by Francis Seymour Stevenson, M.P. London : Printed for the Anglo-Armenian Association. n.d. Pp. 32.

This able little work, of which the first edition is now exhausted and a second is in course of preparation, states the case for the Armenians in a very telling and perspicuous manner, backed up by the opinions of some of our leading statesmen. Of course, it presents one side of the question only, but that has been done well.

The Health-Resorts of Europe. By T. Linn, M.D. London : Hirschfeld Bros., 1893. Pp. 326 and Index.

This book professes to give briefly all necessary information on the important health-resorts of Europe. It follows practically the same lines as Bradshaw's *Bathing-Places and Climatic Health-Resorts* in many ways, although it does not refer to the smaller and less well-known resorts. As far as we have been able to test the information it contains, it is accurate, but we regret that a little more care has not been spent upon its literary style. As we are promised a new edition brought up to date yearly, we trust that the author will attend to this matter, as many of the sentences are involved and obscure ; indeed, many appear to be too literal translations of a French original. Surely "earth-cure" is not a good expression to use to indicate Professor Oertel's method of treating heart-disease, obesity, etc. Apart from this the book is useful.

The Tourist's Atlas-Guide to the Continent of Europe. A Series of Section-Maps and Plans, with Notes for Travellers. By J. G. Bartholomew, F.R.G.S. London : George Philip and Son, 1893. *Price 5s.*

This volume carries out an excellent idea in a very thorough manner. It contains clearly printed maps of the sections of the Continent most frequented by travellers, together with plans of the cities and the chief towns. Take Northern France, for example : there is first a very distinct map of the country north of the Loire and west of Rouen, with all the leading railways ; that is backed by a plan of Calais on the one side, and by a plan of Boulogne on the other ; then there follows a plan of the environs of Paris, embracing an area of twenty miles by twelve ; next comes a plan of Paris on the scale of one inch to the mile, and then a plan of central Paris on the scale of two inches to the mile ; then we have a ground-plan of Versailles on a still larger scale ; a map of Normandy comes next, and is followed by plans of Rouen, Havre, Cherbourg, and Nancy. There are two pages of notes on Paris, arranged under the headings : "Railway Stations," "First-class Hotels," "Restaurants," "Theatres," "Museums," "Public Buildings," etc. etc. For less important places, the notes are limited to a single page. The maps and plans number 168. Prefixed there are a table of moneys, a key-map of routes to the Continent, and an index-map of Europe. The book is sure to become a favourite with travellers.

The Official Guide to the Islands of Staffa and Iona. Eighth Edition. Glasgow : Frederick W. Wilson and Co., 1893. Pp. x + 100. *Price 6d.*

Considering its size and price, this is a remarkably complete guide to two of the most interesting islands on the west coast of Scotland. History and tradition find

ample space, and there are luminous, although short, notes on the geology, fauna, and flora of the district. The illustrations are very clear, and have been carefully reproduced ; but we should have preferred a map showing the islands on a much larger scale.

Illustrated Guidebook to St. Andrews: Historical and Descriptive. Seventh Edition. St. Andrews : W. C. Henderson and Son, Melville Fletcher and Son, J. Cook and Son, and L. Thompson Flood. Cupar-Fife : A. Westwood and Son, N.D. Pp. 76. *Price* 6*d.*

This is an excellent guidebook, containing most information likely to be needed by the ordinary visitor to the town and links. The printing is clear, the matter well arranged, and the illustrations, although of unequal merit, generally excellent. The plan of the town, however, has been rather roughly executed.

Pomphrey's Directory of Wishaw, and Handbook of the Parish of Cambusnethan, with Shotts Supplement. Third Edition. Wishaw : W. Pomphrey, N.D. Pp. 98. *Price* 6*d.; cloth,* 1*s.*

This is a remarkably interesting little handbook, although the author's ideas concerning the ancient inhabitants of the district are rather antiquated. The work must be of great utility for local business men, while the legendary and historical matter gives it a wider interest.

Whiting's Annual Holiday Directory to about 600 *English and Welsh Seaside and Inland Resorts.* 1893 Edition. London : T. J. Whiting and Sons, Limited. Pp. 199. *Price* 1*s.*

This little manual, now in its third year of issue, may be recommended to those who have any difficulty in deciding upon a summer residence, as the information it contains is generally trustworthy and up to date, although in many cases not very detailed. Particulars will be found in it concerning the less-known resorts.

From Golden Gate to Golden Horn, and many other World-wide Wanderings; or, 50,000 *Miles of Travel over Sea and Land.* By CHARLES H. MATTERS, F.R.G.S. Adelaide : Vardon and Pritchard, 1892. Pp. 238. *Price* 1*s.* 6*d.*

If Mr. Matters received any fresh impressions during his long wanderings over the face of the earth, he has not been successful in recording them. The book is a mere globe-trotting compilation, baldly setting forth where the author, with his "wife, eldest daughter, and youngest son," went to, how they travelled, and what they saw. The volume has no geographical value.

Walks in the Ardennes, Cycling, Driving, Boating, by Rail, and on Foot. With some Fishing and Shooting Notes. Edited by PERCY LINDLEY. Pen and Ink Sketches by J. F. WEEDON. London : 30 Fleet Street, N.D. *Price* 6*d.*

Mr. Lindley's comprehensive title-page does away with the need of any long description of the contents of his excellent, well-illustrated, and remarkably cheap handbook. The larger part of the volume, dealing with the various places of interest in the Ardennes and along its borders, is brightly written ; while the pages devoted to boating, fishing, shooting, and cycling are certain to prove of considerable utility.

Andrew Thomson's Yachting Guide and Tide Tables, 1893. London: Thames Yacht Agency. Pp. 148. *Price* 1*s*.

This handy little volume contains much useful and well-arranged information, its popularity being attested by its having reached a thirteenth annual edition. Mr. Thomson announces his intention of excising next year some of the matter now contained in the little book in order to make way for other matter. We should be sorry to see this done, as we believe the volume could well bear additions both in size and price.

Rulers of India: The Earl of Auckland. By Captain L. J. Trotter, Author of *India under Victoria*, etc. Oxford: At the Clarendon Press, 1893. Pp. 220. *Price* 2*s*. 6*d*.

The history of Lord Auckland's administration as Governor-General is virtually the history of the first Afghan War. That so occupied his attention and his energies that, as Captain Trotter says, "little leisure was left for the more congenial work of internal reform," and it is mainly by the results of a foreign policy which proved most hurtful to the well-being of our Indian Empire that his statesmanship must be judged. Captain Trotter has produced a clear, admirably proportioned, and spirited narrative of the events that led to the war, and of the operations of our armies down to the restoration of peace. While, on the one hand, he has evident pleasure in telling and praising the brilliant feats of daring which brought distinction and honour on many subordinate officers, and form bright episodes relieving the pervading tragic gloom, on the other, he is unsparing in his condemnation of the folly and wrong-doing which characterised the inception and conduct of the enterprise, and in exposing the blundering policy and incompetence of badly selected agents and leaders, to which the terrible catastrophe that overtook the force quartered in Kabul must be attributed. To any one who wishes to have a clear apprehension of the object, cause, and issue of the war, and who does not care to wade through the larger histories of Kaye and others, this can be strongly recommended as a trustworthy and competent guide.

Algérie et Tunisie. Récits de voyage et Études. Par Alfred Baraudon. Paris: Plon, Nourrit, et Cie, 1893. Pp. xv + 327.

The author followed the usual traveller's route from Algiers by Constantine to Biskra and Tunis, and then, instead of the ordinary route by sea to Susa (or, as the French call it, "Sousse") and thence by train to Kairwan, he went to the latter place by land, a rough journey for wheeled vehicles after much rain. His descriptions of the country are clear, minute, and often picturesque. He enters into much appreciative detail concerning the architecture of the principal towns, and severely condemns the vandalism which is ruthlessly and unnecessarily destroying much that is interesting and beautiful, and replacing it with the soulless and monotonous productions of the modern European builder. He discourses on Islam and on the commonplaces of Oriental life at greater length than an English traveller would do, but the subject is perhaps less familiar to his readers than to ours. Being an Anglophobe, he has discovered that the little-known organisation of the Senussi is employed by the English in their secret machinations against France, and he asserts, and, we must therefore assume, believes, that the French only annexed Tunis just in time to prevent Biserta being occupied by England. He pays a just tribute of admiration to Cardinal Lavigerie, "le grand Marabout," as the Arabs call him. But the assertion that his *Pères blancs* were the first missionaries at the African lakes is more characteristic than accurate.

NEW MAPS.

EUROPE.

SCOTLAND, Naturalist's Map of ——. By J. A. Harvie Brown and J. G. Bartholomew. *Price* 2*s.* 6*d.*, *Paper;* 3*s.* 6*d.*, *Cloth.*
John Bartholomew and Co., The Edinburgh Geographical Institute.

Naturalists will not expect too much from this map, knowing well that for their purposes nothing short of an atlas can be satisfactory. The authors also know this, for they disarm criticism with a promise. But those who wish to see in effective presentment the height of land and the depth of sea, the relative proportion of arable land, woodland, and moorland, the deer forests and salmon rivers, the lighthouses, the trawling limit, and so on, will find what they wish here. We think that the authors have acted wisely in attending only to these general aspects; for details we must wait for the atlas. For only as one of a series can a map of this kind attain its full utility.

GAIRLOCH AND LOCHINVER. Bartholomew's Reduced Ordnance Survey, Sheet 24. *Price* 1*s. paper : 2s. cloth.* *The Edinburgh Geographical Institute.*

FINLAND, Öfversiktskarta öfver Bärggrunden i Sydvästra ——, på grundvalen af Finlands Geologiska Undersöknings arbeten uppgjord af J. J. Sederholm, 1892. Skala 1 : 1,100,000. *Fennia, No.* 8.

AFRICA.

MOMBASA-VICTORIA LAKE RAILWAY. Natural scale 1 : 1,000,000.
The Geographical Journal, August 1893.

KILIMA-NDSCHARO- UND MERU-GEBIETES, Spezialkarte des ——. Nach Breitenbestimmungen, Routenaufnahmen, Winkelmessungen, etc., von Dr. Hans Meyer, Leutn. v. Höhnel, Dr. Oscar Baumann, u.a. Bearbeitet und gezeichnet von Dr. B. Hassenstein. Massstab 1 : 350,000.
Petermanns Mitteilungen, Tafel 7, 1893.

AMERICA.

ARGENTINISCHEN REPUBLIK, Höhenschichten- u. physiographische Karte des Nordwestlichen Teiles der ——. Von Prof. Dr. Ludw. Brackebusch. Massstab, 1 : 3,000,000. *Petermanns Mitteilungen, Tafeln* 10 *und* 11, 1893.

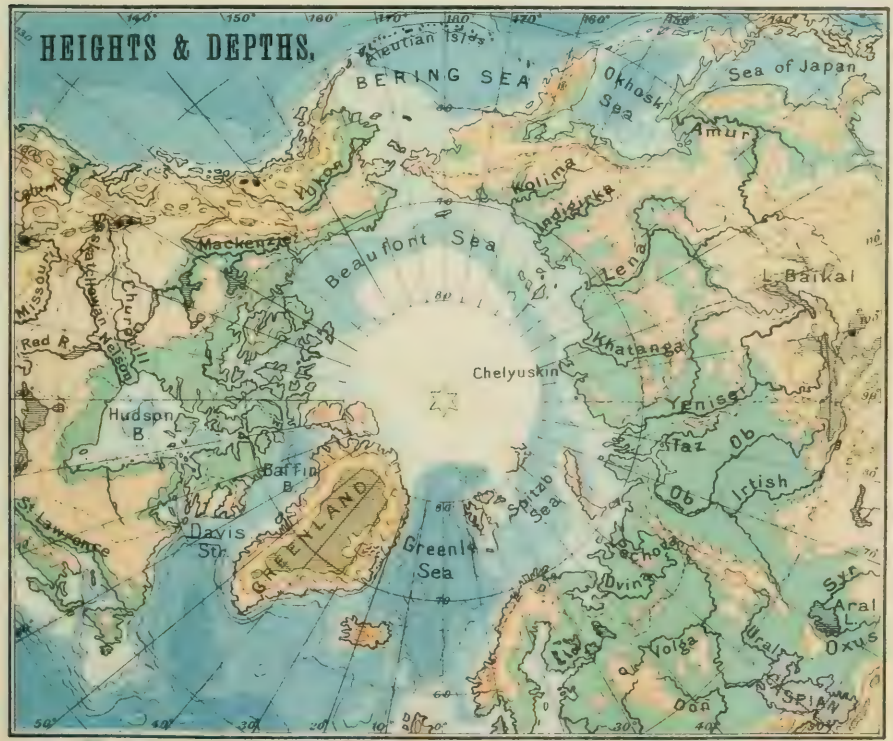
NORDWEST PATAGONIEN, Originalkarte des Limay-Gebietes in ——. Nach eigenen Aufnahmen entworfen und gezeichnet von Dr. Josef v. Siemiradzki. Massstab, 1 : 1,000,000. Uebersicht der Expedition von Siemiradzki, 1891-92. Massstab, 1 : 7,500,000. *Petermanns Mitteilungen, Tafel* 5, 1892.

ATLAS.

ATLAS DE GÉOGRAPHIE HISTORIQUE. Par une réunion de Professeurs et de Savants sous la direction géographique de F. Schrader. 1ère Livraison.
Paris: Librairie Hachette et Cie, 1893.

There are few historical atlases of importance, and this new work, under the direction of a geographer so well known as M. Schrader, should meet with a great demand. We shall be able to speak more fully of its merits when more of the parts have been issued.

SIX POLAR CHARTS illustratin



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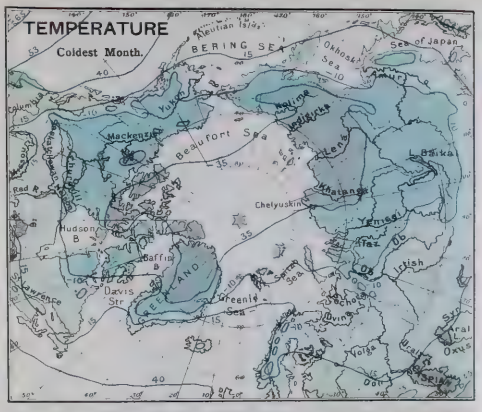
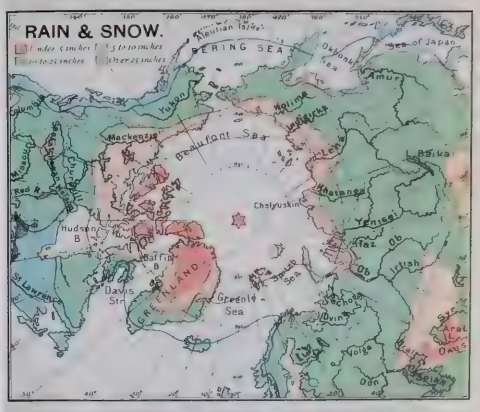
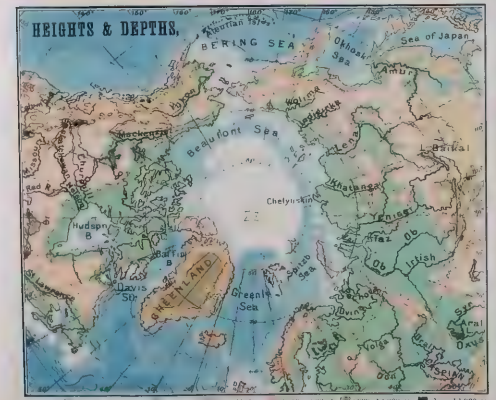
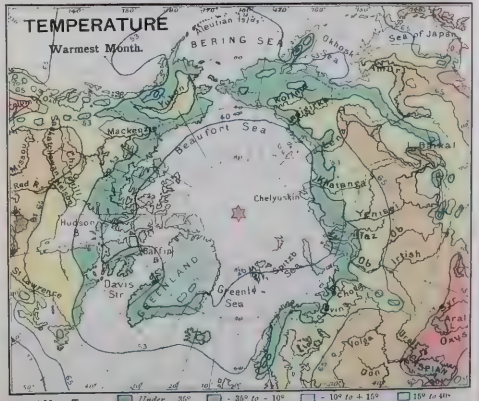
Sea:— *Depth under* 100 *fath.* 100-500 *fath.* 500-1000 *fath.* 1000-2000 *fath.* *Over* 2000 *fath.*

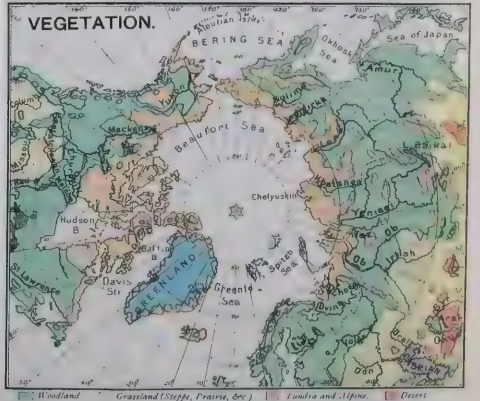
SIX POLAR CHARTS illustrating Mr. HENRY SEEBOHM'S PRESIDENTIAL ADDRESS, Nottingham, September, 1893.











EMIN PASHA

(*From a photograph taken at Zanzibar in* 1891)

THE SCOTTISH GEOGRAPHICAL MAGAZINE.

THE DISCOVERY OF AMERICA BY COLUMBUS:

The Influences which led up to that Great Event, and its Effect on the Development of Oceanographical Knowledge.

By JOHN MURRAY, LL.D., PH.D.,
Of the *Challenger* Expedition.

(Illustrated by Maps prepared by J. G. Bartholomew.)

THE celebration of the four hundredth anniversary of the discovery of America by Columbus has produced within the past few years an abundant literature dealing with various aspects of the great geographical discoveries of the fifteenth and sixteenth centuries. Some of the more important of these books are noted below.[1] One of the most interesting

[1] HARRISSE, HENRY. The Discovery of North America—a critical, documentary, and historic investigation, with an essay on the early cartography of the New World, including descriptions of two hundred and fifty maps or globes existing or lost, constructed before the year 1536; to which are added a chronology of one hundred voyages westward, projected, attempted, or accomplished between 1431 and 1504; biographical accounts of the three hundred pilots who first crossed the Atlantic: and a copious list of the original names of American regions, caciqueships, mountains, islands, capes, gulfs, rivers, towns, and harbours, London and Paris, 1892.

KRETSCHMER, KONRAD. Die Entdeckung Amerika's in ihrer Bedeutung für die Geschichte des Weltbildes; mit einem Atlas von 40 Tafeln in Farbendruck (Festschrift der Gesellschaft für Erdkunde zu Berlin zur vierhundertjährigen Feier der Entdeckung Amerika's), Berlin, Paris, and London, 1892.

WINSOR, JUSTIN. Narrative and Critical History of America, London, 1889.

WINSOR, JUSTIN. Christopher Columbus, and how he received and imparted the spirit of discovery, London, 1890.

PAYNE, E. J. History of the New World called America, Oxford, 1892.

NORDENSKIÖLD, A. E. Facsimile-Atlas to the early history of Cartography, with reproductions of the most important maps printed in the 15th and 16th centuries; translated from the Swedish original by J. A. Ekelöf and C. R. Markham, Stockholm, 1889.

FISKE, JOHN. The Discovery of America, with some account of Ancient America and the Spanish Conquest, London, 1892.

SCAIFE, W. B. America, its geographical history, 1492-1892 (Johns Hopkins University Studies, extra volume xiii.), Baltimore, 1892.

HORSFORD, EBEN NORTON. The Landfall of Leif Erikson, A.D. 1000, Boston, 1892.

of these from the point of view of the geographer is the learned work by Konrad Kretschmer, published under the auspices of the Geographical Society of Berlin, and dedicated to the Emperor of Germany. The text —beautifully printed in large type on elephant quarto—extends to 450 pages. It is accompanied by a splendid atlas of 40 sheets, printed on super-royal folio, in which many facsimiles of the maps and charts of the fifteenth and sixteenth centuries are reproduced for the first time in the original colours. Altogether this magnificent work does great honour to the originators of the undertaking—the Council of the *Gesellschaft für Erdkunde* and its President, Baron von Richthofen. In a series of six most interesting chapters the author deals with the geographical and cosmographical conceptions of antiquity and the Middle Ages, as well as with all the speculations, myths, and discoveries of later times, relating to the American continent. Harrisse in his most elaborate work gives a splendid array of carefully arranged facts, Winsor presents the student of history with a wealth of references, Fiske and Payne offer views concerning the early condition of America at once novel and instructive, while all these books, and many others not here noted, deal with matters of peculiar interest to the geographer, and especially to the oceanographer who desires to trace the gradual development of our knowledge concerning the ocean, as we propose to attempt in this article.

Geographical Conceptions during the Middle Ages.—When the Barbarians overran Europe in the third and fourth centuries of our era, the learning and the science of antiquity were completely swept away. In no branch of knowledge is this more painfully evident than in the science of Geography. The maps of Eratosthenes, of Marinus of Tyre, of Ptolemy, were destroyed or buried beneath the ruins of ancient civilisation. The advanced views of the Greek philosophers concerning the figure of the earth, the motions of the heavenly bodies, and the distribution of land and water were forgotten, and replaced by the crudest conceptions about natural things.

Cosmas Indicopleustes, who had travelled to India in the sixth century, and passed for a great geographer in his time, spurned, like most of his contemporaries, the doctrine of Antipodes. It is absurd, he said, for the earth is not a sphere but a quadrilateral plain 400 journeys, or stations of 20 miles each, in length and 200 in breadth. He gives his views as to the distribution of land and water in a map, on which a transmarine earth is represented, where man was created and where the paradise of pleasure is situated. Four rivers arising in paradise are conveyed by subterranean channels to our own land and burst forth in several places. He explains the form of the world by comparing it with the tabernacle of Moses; the stars are transported by angels, who are likewise charged with regulating eclipses; the succession of night and day is referred to the interposition of a great mountain; the firmament encloses the earth, the ocean, and stars in its crystal walls.[1]

Starting from the scriptural phrase, "the Circle of the Earth," and a

[1] "Topographia Christiana," in Montfaucon, *Coll. Nova Patrum*, vol. ii. pp. 113 and 1706. (See Plate I.)

text of Isidore of Seville, "the earth is so called from its circular form, because it is like a wheel," what are called *Wheel Maps* were constructed, and these ornament the manuscripts of the sixth and seventh centuries. In these maps the earth is divided into an eastern part, representing Asia, and a western part, subdivided into Europe and Africa.[1] Jerusalem occupies the centre of the earth; the north and south diameter is indicated by the Nile and the Tanais;[2] the Mediterranean separates Europe and Africa, and occupies a position at right angles to those rivers.

This suffices to show the infantile notions to which the writers of the Middle Ages had descended: the study of nature was abandoned for the most adventurous speculation; there was a proclivity to twist facts in order to make them agree with what were believed to be religious truths. In this shipwreck of geographical knowledge a few fragments floated. Some dim notions of the ancient science were preserved among the learned, and indeed it may be said that all the sense written about nature during the barbarous period was borrowed from the philosophical works of antiquity—Pliny, Solinus, and Mela being chiefly consulted. It is, indeed, a curious fact that the schoolmen of the Middle Ages derived their first correct knowledge of Greek science from the Arabs, by means of translations of Aristotle and Ptolemy from Arabic into Latin.

When the Arabs extended their sway by a series of most extraordinary conquests, science found a home among them, and geographical knowledge was cultivated. Marvellously endowed and rejoicing in all the vigour of youth, the Arabs in the ninth century extended their voyages as far as China and Japan,[3] Ibn-Vahâb having even visited Pekin.[4] The impression which the description of these strange countries produced on Arab imagination is reflected in the story of Sindbad the Sailor.

It is generally maintained that the Great Ocean to the east of Asia was first made known by the travels of Marco Polo and others during the fourteenth century, but the Arabs were certainly acquainted with this ocean at a much earlier date; they had made frequent voyages beyond the transgangetic peninsula, and they must be credited with the discovery of the great Pacific beyond China, although this discovery produced at that time little effect in the western world.

The Arabs, thus, made an important addition to geographical knowledge, by showing that the Asiatic continent was not indefinitely extended towards the east, by showing that the Indian Ocean was but a part of the all-encircling ocean, and not a great enclosed sea, as supposed by Ptolemy in his Geography. The learned men among the Arabs do not appear, however, to have had any views regarding physical geography in advance of those accepted among the Greek philosophers, and the maps of the Arab geographers were, with few exceptions, of a crude and retrograde character.

One of the most important results arising from the relations of the

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[1] See Plate I.

[2] The river Don.

[3] Japan was known to the Arabs as the Wakwak Islands.

[4] See Reinaud, *Relation des Voyages faits par les Arabes et les Persans dans l'Inde et à la Chine*, Paris, 1845.

Arabs with China is believed to have been the introduction of the mariners' compass. The property of the magnet was known to the Chinese from time immemorial, and they are reported to have applied it to navigation about the fourth century of our era, but this statement is not supported by sufficient evidence. The Arabs are said to have learnt the use of this marvellous apparatus in the East, and through them it passed to the sailors of the Mediterranean. This is much disputed. Marco Polo does not mention the mariners' compass, and we have no certain knowledge that it was in use among Chinese sailors at a time long posterior to the Arab voyages of the tenth or eleventh centuries. There are valid reasons for regarding the compass as an invention of the western world. The Egyptians were accustomed to suspend the loadstone at the end of a string and to observe its motions. In its primitive form among sailors the compass was simply a needle that had been touched with the loadstone and was floated on a piece of cork or on a straw during the night or misty weather. It was known in the West as early as 1100 A.D., and for a long time there appears to have been a prejudice against its use among sailors. Roger Bacon is reported to have said that no master mariner dared use it, so great was the appearance of its being constructed under the influence of some infernal spirit.[1]

The hardy Norsemen enriched the geographical knowledge of the Middle Ages by the discovery and colonisation of Iceland and Greenland,

[1] The following is an extract from a letter from Latini to Cavalcanti describing a visit to Roger Bacon at Oxford, apparently in the year 1258:—

"This discovery, which appears useful in so great a degree to all who travel by sea, must remain concealed until other times; because *no master-mariner dares to use it*, lest he should fall under a supposition of his being a magician; nor would even the sailors venture themselves out to sea under his command, if he took with him an instrument which carries so great an appearance of being constructed under the influence of some infernal spirit. A time may come when these prejudices, which are of such great hindrance to researches into the secrets of nature, will probably be no more; and it will be then that mankind shall reap the benefit of the labours of such learned men as Friar Bacon, and do justice to that industry and intelligence for which he and they now meet with no other return than obloquy and reproach" (see Major, *Prince Henry the Navigator*, pp. 58, 59). Vivien de St. Martin (*Histoire de la Géographie*, p. 247) says it is quite indisputable that the Arabs received from the Chinese the knowledge of the compass, and adds:—"It was through the Arabs that it arrived among the sailors of the Mediterranean at the time of the second crusade, although there is a want of precise information on the subject." Peschel (*Geschichte der Erdkunde*, p. 205) is not so affirmative with respect to this matter; he says:—"That the magnet arrived in Europe from China directly or by the hands of the Arabs has never been thoroughly established." To demonstrate that the Arabs had been the intermediaries, it has been usual to found upon the fact that Albertus Magnus (*De Mineralibus*, lib. ii., tract iii., cap. 6; Lugd. 1651, tom ii. fol. 243) employs the words *Aphron* and *Zoron* to designate the south and the north, and that these words are of Arabic origin. Peschel, relying on the authority of Reinaud (*Aboulféda*, p. ccii.) and of Santarem (*Histoire de la Cosmographie*, tom. i. p. 295) holds that these expressions are borrowed from the Hebrew (see Kluge, *Geschichte des Zeitalters der Entdeckungen*, p. 39). The magnet was probably a Norman discovery. The Italin *bussola* and French *boussole* come from the Flemish *boxel*, hence the expression to box the compass. It is reported to be the invention of Flavio Giogo, of Amalfi, in 1307—probably he first swung the compass on a pivot. It was known as early as 1100 A.D. (see Hallam, *Middle Ages*, vol. iii. p. 394). Alexander Neckham, an English writer of the twelfth century, describes the compass carried by ships (see *Nature*, vol. xiv. pp. 147-148, 1876; Lindsay, *History of Merchant Shipping and Ancient Commerce*, vol. i. pp. xlii., xliii.).

in the ninth century. In the year 1000 Leif Erikson and his companions discovered the coasts of Labrador and Newfoundland (Helluland), Nova Scotia (Markland), and New England (Vinland), but the voyages of these bold mariners were wholly unknown to the nations who did not speak the ancient language of the North. It has been alleged that a Norse colony flourished in Vinland for three centuries, during which time a transatlantic trade was carried on with Norway, and Professor Horsford believes he has found some traces of an ancient Norse city on the Charles River, near Boston, but the absence of nearly all the usual traces of a European colony renders this conclusion extremely doubtful. The settlements formed by Thorfinn and others early in the eleventh century were soon abandoned, and in 1347 we have the last record of a voyage to America.[1] It has likewise been maintained that these voyages of the Northmen led directly to the voyage of Columbus in 1492, but this has in no way been substantiated; it is doubtful if Columbus had even heard of these voyages.

Beyond the introduction of the compass there was little that could be called progress in the art of navigation during the Middle Ages. The Portulanos or compass-charts in use among the sailors of the Mediterranean during the twelfth and thirteenth centuries show, in many respects, however, a decided progress; they display great fidelity in the contours and distances, and a surprising exactness in the form of the coast-lines. In spite of their correctness the Portulanos cannot be regarded as true scientific marine charts; they were constructed without graduation, had no true parallels or meridians, and in these respects are inferior to the maps of the ancients after the time of Eratosthenes.[2]

A revolution was brought about by the Renaissance. Learned Greeks arrived in Italy after the capture of Constantinople in 1453. The introduction of paper and the invention of printing permitted the great geographical works and the advanced ideas of antiquity to be popularised; after the lapse of a thousand years, maps were once more constructed on mathematical principles. What may be called the science of the globe played a large part in the intellectual and moral changes which characterised the transitional period known as the Renaissance. Columbus, Gama, Magellan; America, the route to India, the circumnavigation of the globe—three men and three facts—created the most unique period of the world's history. The memorable discoveries in the thirty years from 1492 to 1522 doubled at a single bound all that was previously known of the surface of the earth, and added a hemisphere to the chart of the world. The sphericity of the earth, the existence of Antipodes, were no longer scientific theories but demonstrated facts. The circumnavigation of the globe was, to the great mass of people, the practical demonstration that our world was swung in space, supported alone by some unseen power. The impression produced on men's minds by these great events is without parallel, and can be traced throughout the literature of the Elizabethan period. Shakespeare appears to have had

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[1] Horsford, *op. cit.*; Rafn, *Antiquitates Americanæ*, pp. 84, etc.

[2] Hamy, *Les Origines de la Cartographie de l'Europe septentrionale*, Paris, 1889.

the mental picture of the great, solid, floating globe continually before him. His spirit seemed

> "to reside
> In thrilling region of thick-ribbed ice;
> To be imprison'd in the viewless winds
> And blown with restless violence round about
> The pendent world."

In the writings of Milton the same influence is even more strongly marked. To understand the full significance of the Renaissance period, it is essential to review the development of the oceanographical conceptions of the ancients down to the time of the destructive incursions of the Barbarians.

Geographical Conceptions of the Ancients.—Kretschmer commences his work with a review of the Homeric notions concerning the world. One could have wished that his views with reference to the Phœnicians had been brought together in a separate section. Long before the Greeks had emerged from the upper strata of barbarism, and long before the oldest Greek and Hebrew records, this remarkable people had spread themselves all over the Mediterranean—the pioneers of European civilisation. They sailed in the Ægean Sea fourteen, and were at Gades on the Atlantic eleven, centuries before Christ. By some scholars they are believed to have emigrated from the shores of the Erythræan Sea or Indian Ocean to the Mediterranean,[1] to have slowly spread themselves along the shores of this great internal sea, and ultimately to have passed westwards beyond the Pillars of Hercules. In the Atlantic they are believed to have recognised from the high tides an ocean similar to the Indian Ocean. In the East the Phœnicians were accustomed to round the southern point of Arabia and sail down the eastern coasts of Africa as far as Sofala; the ruins of Mashonaland appear to mark the site of one of their settlements—possibly the Ophir of the Scriptures.[2] Herodotus believes the story that the Phœnicians had circumnavigated Africa by order of Necho, about 600 years before Christ, but he doubts the statement of these navigators, that the sun was on their right hand in rounding Africa to the south. This statement indicates, however, that the circumnavigation really took place as reported, for it could only have been made by sailors who had penetrated the southern hemisphere.

About the same time the voyages of the two Carthaginians, Hanno and Himilco, took place. Hanno was directed to go to the south, and Himilco to the north, of the Pillars of Hercules. The records of both voyages were long preserved on votive tablets in the temple of Moloch. Hanno's has been handed down in a Greek translation, but Himilco's has been lost, though it was extant in the fourth century of our era. The substance of Himilco's voyage has, however, been preserved in the poems of Festus Avienus and in Pliny; in a work long attributed to the name and authority of Aristotle,[3] and in Theophrastus, we have other references to Carthaginian discoveries in the Atlantic. From

[1] Movers, *Die Phönizier*, Bd. i. pp. 9-12, Bonn, 1841.
[2] J. T. Bent, *The Ruined Cities of Mashonaland*, London, 1892.
[3] *De Mir. Crusc.*, s. 132.

the northern coasts of Spain, Himilco apparently ventured with his fleet on a four-months' voyage into the open sea, and was driven by north winds and fogs to the South. Afterwards they reached a warmer sea, and were apparently becalmed in vast plains of sea-weeds; the ships could hardly be pushed through the interlacing branches; it seemed as if the fleet were passing over submerged land, and they dreaded the neighbourhood of dangerous reefs; large tunnies and other fish swam in and out between the ships. From a careful consideration of all the references to this voyage, there can be little doubt that Himilco had reached the Sargasso Sea, and that his account of this region led the Greeks to regard the Atlantic as shallow, muddy, and little agitated by the winds. The mention of sea-monsters among the sea-weeds shows that the weeds could not have been attached to the bottom, and is therefore in favour of the view that the Carthaginians were becalmed among the masses of gulf-weed. This view is not admitted by either Kretschmer[1] or Krümmel,[2] who regard Columbus as the first European to reach the Sargasso Sea. Had the historical records of the Phœnicians been preserved, we should certainly have found in them more than the merest outlines of their voyages. A people that initiated such extensive explorations must have had in their midst men of learning capable of placing on record the observations of their clever navigators, bold explorers, and eager merchants. All we know of the Phœnicians and Carthaginians is derived from Greek and Roman documents. The Phœnicians, it is well known, took great precautions to hide their oceanic routes from the Greeks, as well as the sources of amber, tin, silver, gold dust, pearls, and aromatics. By exaggerated accounts of the dangers of their distant voyages they excited the imagination of their more bellicose rivals, who ultimately drove them from the sea; hence originated the harpies and griffins of the Pontus Euxinus, Scylla and Charybdis, the gelatinous sea of the north, the shallow and muddy Atlantic, the myth of Atlantis, and other fables.[3]

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[1] *Op. cit.*, p. 165.

[2] *Reisebeschreibung der Plankton-Expedition*, p. 118, Leipzig, 1892.

[3] The discovery of Phœnician coins in Corvo, the most westerly of the Azores, is often cited as evidence that the Phœnicians extended their voyages far into the Atlantic. Johan Podolyn published an account of Carthaginian coins and Punic hoards found at Corvo in 1741 (*Det Wetenskape och witterhett Samhället Handlingar*, Forst Stycket, pp. 106-108, Götheborg, 1778, vale vi. "Några an Märkningar om de Gambel Sjöfast, ianledning af några Carthaginensiska och Cyrenaicka nujut, fundne är 1741 pä en af de Acoricka öarne"). Humboldt had no doubt as to the truth of this find, although he regrets that no full account was preserved of the vase in which the coins were found, and of the construction that surrounded the vase, broken down by a storm in 1749 (*Examen Critique*, p. 232). Chateaubriand, writing in April 1822, says, "It is certain that Phœnician coins have been dug up in the island of Corvo" (*Autobiography*, p. 195). The statement about Carthaginian coins having been found in the Azores is repeated by Sir Daniel Wilson (New Atlantis), and in the *Encyclopædia Britannica* and *Chambers's Encyclopædia*. H. F. Walker discredits the whole story as to the finding of Phœnician or Carthaginian coins in the Azores; he doubts the veracity of the account about the finding of the vase and coins, and states that there is not the slightest corroborative tradition among the inhabitants of Corvo (*The Azores*, London, 1886). Apparently the Carthaginians had no coins prior to the fourth century B.C. Rawlinson thinks some of the more adventurous Phœnician traders may have reached the Azores, the Cape Verdes, and Madeira (*History of Phœnicia*, p. 282). Some Phœnician inscriptions are said to have been found in St. Michael's in the sixteenth

The Grecian narratives of the first nautical expeditions are of great interest to the historian and literary man, for the ancients knew well how to clothe these primitive records with all the charm of their language and brilliant imagination, but they teach us little about the science of the ocean. Grote places the poetical elaboration of the legendary story of the Argonauts between 600 and 500 B.C. This voyage, if it has any foundation in fact, was probably a Phœnicio-Grecian adventure in search of gold.[1] In the time of Homer the Greeks conceived the earth as a large disc with slightly elevated edges; the surrounding ocean was a river with rapid torrents; the external borders of the river ocean supported the transparent celestial vault made of brass and crystal. These cosmographical conceptions had evidently an Oriental origin, and indicate a narrower survey than must have prevailed among the Phœnicians and Carthaginians. It is doubtful if Homer had any clear conception of a communication between the Mediterranean and the external ocean at the Pillars of Hercules.

The first Greek ship is said to have reached Gades in about 631 B.C., the city of Massilia was founded in 600 B.C. by a Phocæan colony; after this date the Greeks commenced to form new views about the stream of ocean. Even passages in Hesiod speak of land on the other side of the ocean stream: the Hesperides, the island of Erythea, are beyond the ocean: the "islands of the blest" are surrounded by the eddies of the sea. The Homeric legends are at times reproduced by Æschylus and Pindar, and the poets of the sixth and fifth centuries before Christ, but as archaic reminiscences assuredly not confounded with the reality. Herodotus, who flourished in the fifth century B.C., rejects the notion that the earth has the form of a disc and that the ocean is a river. No person, he argues, could say whether Europe and Asia were bounded to the north and east by the ocean, but he regarded the Atlantic and Indian Ocean as one and the same body of water.

Kretschmer treats the myth of Atlantis at great length. In this mythical story, Plato[2] supposes a great extent of land situated in the external sea to have disappeared in one day and one night beneath the waters of the ocean; since then, he adds, the Atlantic sea has ceased to be navigable, its waters having become muddy and charged with clay derived from the engulfed land. Kretschmer endeavours to show from the text of Plato that the narration was a pure fiction. It is more probable that the idea was suggested by the reports which reached Plato and the Greeks through the Phœnicians, who, as we have seen, represented the Atlantic as encumbered by shoals and sea-weed. Yet in succeeding centuries many attempts have been made to interpret this story with reference to

century; they were copied or interpreted by a Jew, in Hebrew square characters (see Andre Thenet, *La Cosmographie Universale*, p. 1022, Paris, 1575.) The gulf-weed of the Sargasso Sea is frequently driven to the eastward of Corvo and Flores, the westernmost of the Azores. The word *sargarco* was apparently first applied to the weed of the Sargasso Sea by the sailors of Vasco da Gama, on their return from India in 1499; it is said to be the Portuguese name for *water-cress* (*Nasturtium*) (see Linschoten, *Hist. Orient.*, p. 34).

[1] The name *argo* is possibly of Phœnician origin (*arek*), having reference to the "long ships," or fighting ships, as distinguished from the round or cargo ships.

[2] Born 429 B.C.

America, and to geological phenomena the theatre of which has been placed in the Atlantic. Those who wish to study the Atlantis myth in its wildest form may enjoy some very delightful moments while perusing the letters of Abbé Brasseur and the *Atlantis* of Donnelly.[1] A geological doctrine rests, indeed, on the Atlantis myth. I refer to the transformation of the continental areas on the earth's surface into oceanic areas, and *vice versâ*. This transformation is true enough for coast regions and shallow or enclosed seas, but appears to have little foundation when applied to the continental areas and oceanic basins properly so called.

The first voyage of discovery undertaken by the Greeks was sent out by the Phocæan colony of Massilia (Marseilles) under the command of the illustrious astronomer and mathematician, Pytheas; he visited the coasts of Britain and Germany, and brought home information concerning the amber coasts of the Baltic, and of Thule, which was possibly some point on the Norwegian coast near the Arctic circle, and not Iceland or the Shetlands, as is generally supposed.[2] The high tides in the rivers of Britain made a profound impression on Pytheas; he undoubtedly gave the Greeks a true notion of the tides in attributing them, two thousand years before Newton, to the influence of the moon.

When we turn to the cosmological conceptions of the Greeks, we find that the spherical form of the earth, which must be regarded as the fundamental principle of all scientific geography, was unknown to the Ionian school, but was held by Pythagoras and his followers, not from a study of facts, but rather from speculative considerations. Aristotle established this doctrine by the fact that all things gravitate towards the centre, and by reference to the shadow of the earth during eclipses, and Dicæarchus further supported it from the different times of the rising and setting of the heavenly bodies in different latitudes. Aristotle regarded the habitable world as confined to the temperate zone; he ridiculed the idea that it was circular, and held that there must be in the southern hemisphere a temperate zone corresponding to the northern one, but he does not say it is inhabited. Aristotle gives the first hint about the extent of the Atlantic, and the following passage is believed to have had much influence in leading up to the discoveries of Columbus:—"It appears," he says, "those are not so very far wrong who suppose the region about the Pillars of Hercules and that about India to be contiguous, and that there is but one sea (in the part opposite to the inhabited world), and they point by way of proof to the elephants, these animals being found in both regions, though at the extremes of the earth, this fact showing that the extremes are really near each other."

Eratosthenes was one of the greatest writers of the Alexandrian school; he lived in the third century B.C., and one of his special objects was to reform the map of the world, to reconstruct it on scientific principles.[3] He had the courage to assert that Homer was ignorant of

[1] Donnelly, *Atlantis*, London, 1886.

[2] See Elton, *Origins of English History*, chap. ii.; Rhys, *Celtic Britain*; Markham, *The Geog. Journal*, vol. i. p. 523.

[3] Strabo, ii. c. i. sec. ii.

regions not immediately adjacent to Greece, and he gave much offence by saying that people would never discover the real localities described in the *Odyssey*—the islands of Æolus, Circe, Calypso, etc.—until they had found out the cobbler who had sewed up the bag of Æolus. Eratosthenes adopted the views of Aristotle and Euclid as to the figure and position of the earth, regarding it as a sphere placed in the centre of the universe, around which the other celestial bodies revolved every twenty-four hours, the sun and moon having independent motions of their own. For all practical purposes, his views did not differ from those of the modern geographer, except in the difference between the geocentric and heliocentric standpoints. The maps of Hecatæus and others were mere pictures, without scale, representing the habitable world as half as long again as broad. Dicæarchus divided the known world by a line in the sense of our Equator, along which were divisions in stadia.[1] Eratosthenes went further: he divided the space occupied by the habitable world by lines at intervals parallel to the Equator, and he drew a meridian line at right angles to these passing through Alexandria, thus introducing for the first time what we now call parallels of latitude and meridians of longitude. Eratosthenes, having estimated the distance between Syene and Alexandria at 5000 stadia, and regarding this as one-fiftieth of a great circle of the sphere, calculated the circumference of the earth to be 250,000 stadia (equivalent to 25,000 geographical miles), a surprising approximation to the truth. From this he estimated the circumference at 200,000 stadia on the parallel of Rhodes and the Pillars of Hercules; the habitable world he regarded as a little more than a third of the circumference in that latitude; the interval of two-thirds he conceived as filled up by the ocean, and he says: "If it were not that the vast extent of the Atlantic sea rendered it impossible, one might even sail from the coast of Spain to that of India along the same parallel."[2] This is the first record of theoretical views on the possibility of circumnavigating the globe. (Plates I.-III.)

Hipparchus, the greatest astronomer of antiquity, who was posterior to Eratosthenes by about twenty years, clearly conceived the idea, afterwards adopted by Ptolemy, of a map of the habitable world in which every important point should be laid down according to latitude and longitude, determined by astronomical observations, although at the time the construction of such a map was wholly impossible in practice. He drew circles of the sphere on the maps, the meridians being represented by convergent curves; henceforth each new point on the globe, when determined, could be placed on the map with great exactitude; henceforth the navigator could point out to others the course he had followed in his voyages. Hipparchus did not admit that the Atlantic and Indian Oceans were connected towards the south of Africa; his views were apparently based on some observations of a Babylonian, Seleucus, with reference to the tides, which appeared to Hipparchus incompatible with the idea of a circumfluent and continuous ocean.

[1] One stadium = 600 feet = 100 fathoms, or a cable's length. The fathom was used by the ancients as a measure of length as well as depth (*ὀργυιά*, the outstretched arms).

[2] Strabo, i. p. 64; Bunbury, *History of Ancient Geography*, vol. i. p. 627.

Posidonius, who lived in the first century before our era, visited Spain to view the external sea with his own eyes, to measure the tides, and to judge for himself concerning the popular legend, which related that the sun when sinking into the Western Atlantic made a hissing noise as when a red-hot body is plunged in water. Not only did Posidonius observe the daily flux and reflux of the tide, but he noted its monthly variations, and attributed these to the divers phases of the moon; he showed, indeed, that high tides always coincided with full moon, and low tides with the last or intermediate quarters of the moon. Posidonius accepted Eratosthenes' estimate of 3750 stadia as the distance between Rhodes and Alexandria, and this difference of latitude he regarded as $\frac{1}{48}$ of a great circle; from these data he made the whole circumference only 180,000 stadia. This estimate was accepted by Ptolemy and the later Greek geographers in preference to the more correct estimate of Eratosthenes. The length of the habitable world he estimated at about 70,000 stadia, which he considered just half the circumference on the circle of latitude passing through Rhodes and the Straits of Gibraltar, and he states that only 70,000 stadia would be required to be traversed by a vessel sailing with an east wind from the west of Spain to India.[1] Like Eratosthenes, we thus find him speculating on a circumnavigation of the world many centuries before Columbus.

Never was there a period more favourable than the reign of Augustus for the composition of a great work on descriptive geography. Roman rule extended over more than half the then known world, and Rome was attached by political and commercial relations to all outlying countries. The Romans were a warlike and practical people, with politicians, jurists, encyclopædists, and historians, but we find among them few philosophers who occupied themselves with the operations of nature, and few writers who have made important contributions to geography. The man, who appeared to carry out the geographical work for which the time was ripe, was a Greek, Strabo, who produced the most important geographical work of antiquity. Strabo dealt in a special manner with the distribution of land and water on the surface of the globe, and with questions of physical geography. His views on the sculpturing of continents were much the same as are now held by modern geologists. According to his view all seas were united together; the surface of the sea was spherical, and the centre of this sphere coincided with the centre of the earth. Strabo held that besides the known world of the Greeks and Romans in the temperate zone of the north, there might yet be other worlds to be discovered, and he points out that these might be inhabited by different races of men.[2] Pomponius Mela, who likewise belongs to the first century of our era, speaks as an undoubted fact of the existence of the Antichthones, inhabiting continental land in the southern temperate zone, though they were inaccessible owing to the heat of the intervening torrid tract; but this continent must have been a purely theoretical assumption, although Ceylon was sometimes regarded as the commencement of such a southern continent.[3]

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[1] Plate IV. [2] Strabo, i. 4, ii. 5. [3] See Bunbury, *op. cit.*, vol. ii. p. 353.

Strabo does not seem to have been acquainted with a contemporary, Hippalus, who observed the regular alternations in the direction of the monsoons of the Indian Ocean, and profited by this discovery to open up a route across the high seas between the shores of the Red Sea and India, thus giving a great impetus to voyages in Oriental waters.

The philosopher Seneca presents in his writings a general view of the knowledge of the ancients concerning the natural sciences, and he too speculates as to the extent of the Atlantic Ocean. He asks: "How far is it, then, from the outer coasts of Spain to India? A very few days' distance if a full wind fills the sails." [1]

Marinus of Tyre, who lived in the second century of our era, rejected the opinion of his immediate predecessors with reference to the distribution of land and water, and maintained that the habitable world was not surrounded by the waters of the ocean. He held that the known continents were united to other similar masses still unknown, and that the Atlantic and Indian Oceans were separated from each other; he attributed to Asia an indefinite extension towards the east. It is difficult to conjecture the reasons which induced Marinus to abandon the wiser and more correct views of Eratosthenes on these fundamental points of geography.

Ptolemy adopted the views of Marinus, and gave to his works a scientific stamp. Ptolemy was an astronomer, and the greater part of his works are taken up with the tables containing the materials which served him in the construction of his maps. In projection he was far in advance of his predecessors, and first used the words latitude and longitude as purely scientific terms. He rejected the hypothesis of an ocean extending to the east of the Asiatic continent, regarding that great land mass as extending indefinitely to the north and east. Africa was, in like manner, extended without any settled limitation towards the south. Eratosthenes, Hipparchus, and even Strabo, did not know that the east coast of Africa turned suddenly to the south-west beyond Cape Gardafui; they believed that the shores of the regions which produced myrrh and incense extended as far as India. Ptolemy adopted this view, although the merchants of Aden had informed him of the true position of the coasts as far south as Zanzibar.[2] Ptolemy therefore united the coasts of Africa, where they appeared to trend to the east, by unknown lands to the Chinese coasts. The Indian Ocean thus formed a great enclosed sea like the Mediterranean, and the unknown lands called *Southern Ethiopia* remained on maps down to the time of the second voyage of James Cook.

With Ptolemy disappeared the great geographers of antiquity. Two views prevailed among the ancients regarding the distribution of land and water. The school which may be called Homeric—to which Eratosthenes and Strabo belonged—considered the three continents of the Old World as forming a single island surrounded by the ocean. On the other hand, the adherents of what may be called the Ptolemaic school did not admit the extension of the ocean around the known world.[3] They considered the Atlantic and Indian Oceans to be great enclosed seas; they

[1] Seneca, *Quæst. Nat.*, ii.

[2] See *Periplus of the Erythræan Sea.*

[3] Called also Continental and Oceanic Theories.

held that the extreme points of the known land towards the east and the west approached so nearly to each other that, parting from the west, a ship might easily reach the eastern extremity, which was regarded as greatly extended. This error was perpetuated, thanks to the influence of Ptolemy, and, fourteen centuries afterwards, led indirectly to the discovery of the New World by Columbus.

The Renaissance.—The intellectual nightmare of the Dark and Middle Ages was shaken off by a colossal activity of the European mind during the fourteenth and fifteenth centuries. This movement, known as the Renaissance, took its origin in Italy when men began to gain a more correct knowledge of the scientific conceptions and the literary achievements of the ancient world. A study of the works of Aristotle, of the geography of Ptolemy, and the writings of other Greek and Roman philosophers, introduced new ideals of human life, new interest in the material world, new departures in education, and finally a spontaneity in thought and action arose, which culminated in a revolt against almost every form of ecclesiastical and intellectual tyranny. The Renaissance was far from being a mere re-birth of antiquity; the centre of civilisation and commercial activity was transferred from the coasts of the Mediterranean to those of the Atlantic; Western nations provided a home for science and literature; the Great Ocean replaced the Mediterranean; man's intellectual horizon became world-wide.

Dante may be called the herald of the Renaissance. He discussed with his contemporaries the sphericity of the earth and the equality of the sea-level in different oceans; he regarded a voyage across the Atlantic as a light task. He makes Ulysses urge his companions to venture into the Great Ocean beyond the Pillars of Hercules:

> "O Brothers, who through such a fight
> Of hundred thousand dangers West have won,
> In this short watch that ushers in the night
> Of all your senses, ere your day be done,
> Refuse not to obtain experience new
> Of worlds unpeopled, yonder, past the sun." [1]

Roger Bacon adopted Aristotle's view that there was no great distance between Spain and India, and supported it by reference to the passage in Esdras: "Upon the third day Thou didst command that the waters should be gathered in the seventh part of the earth; six parts hast Thou dried up and kept them," the inference being that the dry land was seven times greater than the ocean.[2] Similar arguments were made use of more than a century later by Pierre d'Ailly in a popular work written early in the fifteenth century.[3] Columbus's own copy of this book is still to be seen at Seville with his annotations on the margin, and here he first became acquainted with the arguments of the Greek philosophers concerning the probable extent of the habitable world and with their speculations about the possibility of crossing the Atlantic to China and

[1] *Inferno* (Sibbald), Canto xxvi.
[2] *Esdras*, vi. 41.
[3] *Imago Mundi*, finished about 1410.

India. Another favourite with Columbus was the singular and wonderful book of Sir John Mandeville, in which there is a legend of an Englishman who had sailed around the whole world, passing on the way thousands of islands.

During the thirteenth century the great Mongol conquests in Asia and eastern Europe opened up a way from Europe to China, and for nearly a century European missionaries and traders visited these little-known and fabulous countries in the far East. Among others, the three Polos—father, uncle, and son—returned to Venice, after an absence of twenty years, with their coats lined with diamonds, rubies, and other jewels, and spread them before their astonished and envious countrymen. Marco Polo's account of his travels was written down in 1299, but they appear not to have been generally known till about the middle of the fifteenth century. Roger Bacon and Dante, as well as the author of Mandeville's travels who cribbed in all directions, do not seem to have known about Marco Polo's adventures. The Chinese seas had, as we have pointed out, been visited by Soleiman and other Arab sailors during the ninth century, but these voyages appear to have been wholly unknown in western Europe. Marco Polo gave the first definite information as to the limits of the Asiatic continent towards the east. Ptolemy, it will be remembered, had united the east coast of Africa by unknown lands to the remote portions of Asia, which he regarded as indefinitely extended towards the east in "reedy and impenetrable swamps." The results of Marco Polo's travels are for the first time shown on the Catalan Chart of 1375, now in the National Library of Paris. The Indian Ocean is no longer represented as a Mediterranean or enclosed sea. India appears for the first time on a map as a peninsula. Cathay is placed in the true position of China, and there is a great ocean beyond Asia.

The re-appearance of Ptolemy's Geography with its clearly drawn maps produced a profound effect in Western Europe. Nordenskiöld says that when this great work was imported from the expiring Byzantine Empire in the fifteenth century, it had the effect of an important discovery, which seized on men's minds at first with even more force than the re-discovery of the New World by Columbus. The influence of Ptolemy's Geography commenced from the time of its translation into Latin, for at that time the knowledge of Greek was slight even among the learned men of the West. The invention of the printing-press enabled seven large folio editions to be published before the end of the fifteenth century. Indeed, all the geographical maps published from 1492 down even to 1570[1] were Ptolemy's, with additions from the Portulanos of Mediterranean sailors, and sketches showing the more recent discoveries in the Great Ocean. Ptolemy's geographical conceptions prevailed throughout the whole period of great geographical discoveries, and were imported into all the early charts of America. It is interesting to note that *Cattigara*, which was an emporium in the extreme east of Asia in the time of Ptolemy, appears on the western coast of South America in the maps of the sixteenth century.

The revelations of Marco Polo concerning the great Eastern Ocean

[1] When *Orbis Terrarum*, by Ortelius, was published.

rendered it necessary to make important changes in Ptolemy's map of Asia. There is evidence that this subject was much discussed in European cities, where some few men took an interest in geographical questions. The great Florentine astronomer Toscanelli was, so far as we know, the first to give definite shape to the new views, and to discuss in a scientific way the subject of transatlantic lands. In the year 1474 he addressed a letter and a map to the King of Portugal, setting forth clearly that it was possible to reach the land of spices by sailing westward. Years afterwards, probably in 1480, Columbus asked Toscanelli for information concerning the way to the Land of Spices, which it was thought possible to reach by sea direct from Europe. Toscanelli replied by sending a copy of the letter and map he had previously sent to the King of Portugal, and at the same time encouraging Columbus to undertake the voyage across the Atlantic. Columbus is believed to have taken Toscanelli's map with him on his first voyage. The map has been lost, but has been reconstructed, chiefly from materials furnished by the globe of Martin Behaim, which bears the date of 1492. Toscanelli's letter plays such a large part in the geographical data which led to the discovery of America, that it is given in full below.[1]

[1] The following translation of Toscanelli's letter and postscript is given in Harrisse (*op. cit.*, pp. 381-384) :—

COPY *sent to* CHRISTOPHER COLONBO *by* PAUL *the physician, with a nautical chart.*

To Ferdinand Martins, a canon in Lisbon, Paul the physician, greeting :—

I have learnt with pleasure that your health is good, and that you are on terms of intimacy with your very generous and very magnificent sovereign. On a previous occasion I have spoken to you of a sea route to the land of spice shorter than the one which you [*i.e.* the Portuguese] take by the way of Guinea. That is the reason why the Most Serene King asks of me to-day information on the subject, or, rather, an explanation sufficiently clear to enable men, even but little learned, to understand the existence of such a route. Although I know that it is a consequence of the spherical form of the earth, I have decided, nevertheless, so as to be better understood and to facilitate the enterprise, to demonstrate in constructing a nautical chart that the said route is proved to exist. I therefore send to His Majesty a map which has been drawn with my own hands, and on which are marked your coasts and the islands which may be taken as a starting-point, when you undertake the voyage, by steering constantly towards the west. You will also find thereon the indication of the countries which you must fall in with ; how much you will have to deviate from the Pole, and from the equinoctial line ; and finally, the space, that is to say, the number of leagues you have to sail over to reach the country which is so rich in spice and precious stones of all sorts. Do not be surprised if I call the country of spices a *western* country, whilst it is the custom to call it *eastern*. The reason is, that in making the voyage by sea in the hemisphere which is opposite our own, that country will always be found on the west side. If, on the contrary, the land route is adopted in crossing the higher hemisphere, it will always be found in the east. The longitudinal lines traced on the map show the distance from east to west, the horizontal ones show the distance from south to north. I have also marked, for the use of navigators, several countries where you may touch, in case contrary winds or some accident should drive mariners to some other coast than the one intended. I wanted to enable them to show the aborigines that we were not without possessing some knowledge of their country, which must please them. Only merchants, as we are informed, settle on those islands ; for there is such a great concourse of navigators with goods that the port of Zaiton alone, which is famous, contains a greater number of them than all the rest of the world together. It is asserted that every year one hundred large vessels loaded with pepper arrive in that port, without speaking of the other ships which bring different kinds of spice. That country is very much peopled, and very rich. It is composed of a multitude of provinces, kingdoms, and innumerable cities, all of which are under the sway of a single prince called "The Grand Khan." That title means "The King of Kings." His

The necessities of commerce had, however, a more powerful influence in leading up to the discovery of America than any scientific speculations of the learned. The capture of Constantinople by the Turks in 1453 closed the overland trade routes to the east, which, for over 100 years, had brought trade and wealth to Venice, Genoa, and Western Europe. Turkish pirates so overran the Eastern Mediterranean that Christian vessels were no longer safe. It became essential to look towards the external ocean for another route to India, Cathay, the islands of spices, and all the charms and riches of the East.

Two Genoese galleys, and Jaime Ferrer, a sailor of the island of Majorca, made unsuccessful attempts to find a way around Africa to India in the fourteenth century, but the Portuguese expeditions along the west coast of Africa must be regarded as the real prelude to the grand maritime discoveries of the fifteenth century. When Prince Henry the Navigator established his maritime observatory at Sagres, employed the best Italian map-makers and pilots, and commenced to give an impulse to the navigators of Portugal, these were so incompetent that they dared not venture more than six miles from the coast. All the expeditions sent to round Cape Bojador even up till the year 1433 returned unsuccessful, because a reef extended six miles seawards and barred the passage. This cape was cleared by Gil Eannes in 1434, and by the time of Prince Henry's death in 1460, the Portuguese had reconnoitred the

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residence is mostly in the province of Cathay. His ancestors being desirous to have intercourse with the Christians, sent, two hundred years ago, an embassy to the Pope to obtain doctors in theology to teach them the Catholic religion, but the envoys were prevented from continuing their route, and returned home. In the time of Eugene one of them visited the Pope, and assured him that his countrymen entertained very good feelings towards Christians. I have conversed with him a great deal on all topics. He spoke to me of the large size of the royal palaces; of the prodigious extent of rivers in breadth and length; of the multitude of cities built on their banks (nearly two hundred towns were on the banks of a single river); finally, of marble bridges very wide and very long, adorned with a double row of columns. That country deserves to be sought after by the Latins, not only because enormous wealth can be acquired there in gold, in silver, in precious stones of all kinds, and in certain sorts of spice which never reach our country, but on account of the scholars, philosophers, and learned astrologers (from India), who may teach us by what means a province so powerful and so magnificent is governed, and their manner of waging war.

Let these short details suffice to satisfy, in a measure, the King, who asked for information. My occupations, which absorb my entire time, do not allow me to speak more at length. But, later on, I shall be disposed to comply with the desires of His Royal Majesty as extensively as he may wish.

Given at Florence on the 25th of June 1474.

From the city of Lisbon towards the west in a direct line there are twenty-six spaces (of 250 miles each) marked on the map as far as the famous and very large city of Quinsay. The circumference of that city is 100 miles. It possesses ten bridges, and its name means "The City of the Heavens." They relate marvellous things relative to the multitude of objects [of art?] found there, and the amount of its revenues. That space is about one-third of the entire globe. The city is in the province of Mango, near that of Cathay, in which is the royal residence. From the Antilia island, which you know, to the famous island of Cipango there are ten spaces. That island yields quantities of gold, pearls, and precious stones. The temples and palaces of the King are inlaid with plates of gold. It will not be necessary, therefore, to cross very extensive spaces over the sea on an unknown route. Perhaps I should have given more minute details on many things, but a careful observer can of himself supply much of what may be wanting. Good-bye, dearest.

coast of Africa for 1700 geographical miles. Bartholomew Diaz reached and doubled the Cape of Good Hope in 1486. Fiske gives good reasons for believing that the younger brother of Columbus was with Diaz on this celebrated voyage, and we can well imagine the effect produced on the mind of Columbus by the success of this great Portuguese expedition. Diaz had dealt a death-blow to Ptolemy's view as to the Indian Ocean being an enclosed sea; the fiery zone of the ancients had been crossed, the southern temperate zone of Aristotle and Mela had been reached. The air was filled with the noise of discovery. Columbus became more impatient to start on his daring voyage across the Atlantic. In the famous poem of the Italian poet Pulci, published in 1481, there is a remarkable passage which anticipates the discovery of America and the circumnavigation of the globe:—

". . . his bark
The daring mariner shall urge far o'er
The western wave, a smooth and level plain,
Albeit the earth is fashioned like a wheel.
Man was in ancient days of grosser mould,
And Hercules might blush to learn how far
Beyond the limits he had vainly set
The dullest sea-boat soon shall wing her way.
Men shall descry another hemisphere,
Since to one common centre all things tend,
So earth, by curious mystery divine,
Well balanced, hangs amid the starry spheres."[1]

For twenty years Columbus had been drawing charts, studying philosophical works, visiting the seas of Europe and Africa, from Iceland to the Gold Coast, and soliciting help for his great undertaking in all directions. He had seen or heard of the strange trees, fruits, canes, skin-canoes, and even the dead bodies of bronzed men, that had from time to time been washed up on the shores of the western islands, and all these he regarded as indications of undiscovered lands at no great distance in the western ocean. He had made himself fully acquainted with all that was known about voyages in the west, and had collected all the available information about the imaginary islands of Brazil, Antilia, and St. Brandon. He may possibly have heard of the Norwegian voyages to Vinland, or even of the voyages of Zeno to Greenland, but they can have had little influence on his mind. His fixed idea was to sail direct to the territories of the Great Khan, to the golden cities described by Marco Polo, and not to a cold land inhabited by the "skrælings" of Leif Erikson. He had considered the problem of reaching the rich cities and countries of the far East by sailing directly across the Atlantic in all aspects, and he had persuaded himself that the distance was even less than the estimate of Toscanelli. At last he found Ferdinand and Isabella of Spain prepared to fit out his expedition, and to accept his stipulations in respect to honours and rewards in the event of success. He calculated that there were not more than 90° between the Canary

[1] *Morgante Maggiore*, canto xxv., st. 229.

Islands and the eastern shores of Asia, and he estimated these on that parallel at 1100 Spanish leagues,[1] equivalent to five weeks of direct navigation: he thus erred by 110° or about 2000 leagues. The doctrine of Antipodes was far from being currently accepted; an instinctive terror was awakened at the idea of sailing into an immense unknown sea at a time when the most daring navigators barely lost sight of land. Yet Columbus surmounted all the prejudices of his day. His embarkation at Palos, his rest at the Canaries, his passage through the Sargasso Sea, his arrival in October 1492 at Guanahi, need not be described in detail. He had shaped his course for the north end of Cipango (Japan). He reached a land inhabited by people, some still in a state of savagery, and none of them raised above the middle strata of barbarism. In the newly-discovered land Columbus was further from the riches of Cathay than when he left Spain; he spent months, nay years, in searching, on the opposite side of the world from its real position, for the kingdom of the Kublai Khan, to whom he had a letter from Ferdinand and Isabella, two hundred years after the death of that monarch, and indeed a hundred years after the Grand Khan's race had been driven from the throne of China!![2]

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[1] A Spanish league equals 4·214 miles.

[2] It has been several times proposed to canonise Columbus. In the estimate of the character of Columbus there is as wide a difference of opinion among modern writers as among his contemporaries, as may be seen from the following interesting extracts:—

"Enthusiastic biographers, beginning with Ramusio, have placed Polo on the same platform with Columbus. But where has our Venetian traveller left behind him any trace of the genius and lofty enthusiasm, the ardent and justified previsions which mark the great Admiral as one of the lights of the human race?"—Yule, *The Book of Ser Marco Polo*, Introduction, p. 102, London, 1875.

"We have seen a pitiable man meet a pitiable death. Hardly a name in profane history is more august than his. Hardly another character in the world's record has made so little of its opportunities. His discovery was a blunder; his blunder was a new world; the New World is his monument! Its discoverer might have been its father; he proved to be its despoiler. He might have given its young days such a benignity as the world likes to associate with a maker; he left it a legacy of devastation and crime. He might have been an unselfish promoter of geographical science; he proved a rabid seeker for gold and a viceroyalty. He might have won converts to the fold of Christ by the kindness of his spirit; he gained the execrations of the good angels. He might, like Las Casas, have rebuked the fiendishness of his contemporaries; he set them an example of perverted belief. The triumph of Barcelona led down to the ignominy of Valladolid, with every step in the degradation palpable and resultant."—Winsor, *Christopher Columbus*, p. 512.

"The acquisition of gold took a very secondary place in the mind of this great man, whose unselfish thoughts were ever bent on the achievement of discoveries for the welfare of the human race. His character was noble and generous, and this appears over and over again, when he had to make choice between his own interests and his duty. . . . The brightest light of that age was put out. The beacon round which had centred its great aspirations, its enterprise and its science, was dimmed for a time, but only to burn still brighter in the ages to come, as a glorious example for all future generations."—Markham, *Life of Christopher Columbus*, pp. 257, 291, 292.

"It was entirely with the expectation of crossing this sea, and reaching India from Spain, that Columbus concerned himself. Nothing was further from his purpose than mere discovery. He was inspired by the hope of reaching that famous land of gold, pearls, and spices, which was now more than ever attracting the attention of Europe. He wanted no new worlds; and if he had been told the fact that western Asia is really about three-fourths of the earth's latitude from Spain, and that the westward voyager would have to encounter on his way a

The Atlantic had been crossed, but the great Genoese had no suspicion of a vast new Continent, nor of the greater ocean beyond. The Bahamas were for him the spice islands of the East, and Cuba a part of the Asiatic Continent. Only the first step in the discovery of the New World had been taken; it took many years and many voyages to complete the discovery of America. Other expeditions, official and clandestine, crossed the Atlantic in rapid succession. While the Cabots and the Cortereals explored the coasts of North America from Labrador to Florida, Columbus visited many of the West Indian Islands and the north coast of South America. Pinzon and Solis with Vespucci landed at Honduras, and coasted around the Gulf of Mexico;[1] Pinzon explored the coast of South America to 8° south, and Cabral was accidentally driven on the coast of Brazil in 1500, and explored from 12° to 16° south. This landfall of Cabral is interesting as showing that even without Columbus the discovery of America could not have been long delayed. Gama had passed the Cape of Good Hope and reached Hindustan in 1497, thus effectually eclipsing for the time the discoveries of Columbus in the west. Portuguese voyages to India by way of the Cape at once became frequent, and it was on one of these that Cabral was accidentally thrown on the coast of South America; this land, being east of the Papal line, was claimed for Portugal.

It has generally been held that Columbus lived and died in the belief that he had reached the Asiatic continent. We know that during his second voyage he made his crew affirm before a notary that Cuba was a part of Asia, and that as late as 1503 he wrote to the Spanish sovereigns that he had reached the province of Mango, near Cathay. In going west he believed he was approaching the mysterious realms of Prester John. Harrisse has, however, produced documentary evidence that some of Columbus's companions and contemporaries, nay, even Columbus himself, had clearly recognised, as early as 1501, that the coasts of the New World were not the coasts of Asia represented on the chart of Toscanelli.[2] The absence of all domestic animals among the natives, as well as of all the civilisation, wealth, and display of the fabulous East, must have forced this conclusion on the mind of Columbus, although he may have felt that

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vast continent stretching nearly from pole to pole, impassable at the north, passable only with peril and difficulty at the south, and mainly inhabited by irreclaimable savages, he would probably have abandoned his design. . . . The quest of gold was the main object of the expeditions of Columbus. His letters evince this at every turn: and he delighted in making pompous eulogiums on its moral and religious value. Gold, he writes, is an excellent thing: who hath this, hath all that can be desired in the world: gold can even bring souls into Paradise. In the pursuit of gold, Columbus himself introduced into America that accursed traffic in human flesh which our own generation has not yet seen abolished. The riches of the Indies, he said, are the Indians. On the day after his arrival in America he talks of the prospects of a traffic in the Indians as slaves; of these idolaters he says: I can send to Europe whole shipsful."—Payne, *op. cit.*, pp. 47 and 171.

[1] Varnhagen and Fiske appear to have satisfactorily explained the mystery about the first voyage of Vespucci; he sailed with Pinzon and Solis as pilot and cosmographer in 1497, explored the coasts of Honduras and Florida, and returned in October 1498 by way of Bermudas with 222 slaves on board.

[2] *Op. cit.*, pp. 97, etc.

to acknowledge this to the Spanish sovereigns would have proved fatal to further discovery in the West. We know he prevented some of his companions, who held these views, from returning to Spain, fearing the result should such opinions be made known at the Spanish Court. Indeed, as early as the second year of the sixteenth century, the eastern coast lines of the American continent had been more or less carefully examined from Labrador to the mouth of the La Plata, and every endeavour was being made to find a strait leading towards the Indies.

On the 25th September 1513, from the summit of the Sierra Quarequa, Vasco Nuñez de Balboa beheld a boundless ocean extending towards the setting sun—the Pacific was discovered. During many years a passage into this further ocean was in vain sought for in all directions, towards the north as well as towards the south; this was finally discovered by Magellan. In October 1520 he entered the mouth of a passage in 52° south latitude, henceforth to be known as the Straits of Magellan, and in November, on leaving these straits, he beheld the mighty ocean which he named the Pacific. For ninety-nine days Magellan ploughed the waters of the Pacific—the most extraordinary voyage on record, far surpassing the exploit of Columbus in the Atlantic, both in boldness and in the effect it produced on geographical conceptions. On the 6th March 1521 the Mariana Islands rose before Magellan, and ten days later his flotilla reached the islands which were to bear the name of the Philippines, where Magellan lost his life in a fight with the natives of Mactan. Only one of his vessels ultimately reached Spain. Magellan had finally solved the problem of western navigation, the sphericity of the earth, and the existence of the Antipodes. We have already dwelt on the immense effect produced on the human mind by the first circumnavigation of the world.

Twenty years had not passed away from the time when Gama passed the Cape of Good Hope, before the Portuguese pilots had mapped out the hydrography of the Indian and Chinese seas. The exploration of Eastern Africa was completed, the Red Sea and Persian Gulf were recognised. The peninsula of India, and the transgangetic peninsula were drawn in their true form, a great part of the archipelagos extending from Sumatra to the Moluccas and New Guinea had been visited. When Albuquerque carried Malacca by storm in 1511, a new centre of operations was created in the extreme east. Portuguese vessels radiated in all directions towards Oceania. The coasts of China, Sumatra, Java, Sunda, the Philippines, Japan, Borneo, Celebes, and the north-west coast of New Guinea, were explored within a few years. When we recall the representations on the map of Ptolemy, or even those on the charts of the fifteenth century, we gain some idea of the immense additions to our knowledge which were acquired in the thirty years following the discovery of America by Columbus.

Fifty-seven years elapsed before Drake accomplished the second circumnavigation of the Globe. Drake was the first to see Cape Horn, and to explore the western coasts of North America, nearly as far as the Vancouver Archipelago. Many explorers, such as Cavendish, Hawkins, and Mendaña, followed in the wake of Magellan and Drake, while Cartier,

Frobisher, and Davis made discoveries in other directions, so that the maps drawn in the last quarter of the sixteenth century show the general contour of the land masses in as exact a manner as could be expected from nautical surveys aided by the compass, and based on determinations of latitude, correct to within one-third of a degree, but without any astronomically determined longitudes; the extremities of the new continent were alone vague

The geographical work of the sixteenth century was continued, but with less vigour, during the seventeenth century. Many voyages were undertaken by the English and Dutch East India companies. Schouten discovered the passage into the Pacific to the south of Tierra del Fuego, Tasman discovered Van Diemen's land, New Zealand, and Tongatabu, and the French carried out many exploring enterprises in North America. Towards the middle of the seventeenth century the relations of land and water had been directly observed on two-thirds of the earth's surface.

When, in 1728, the Russian expedition under Bering passed through the Straits which bear his name, the discovery of the continent of America may be said to have been completed, and the new world stood revealed in its broad and general outlines, but it is not without a certain amount of surprise that we notice a dearth of discoveries between 1648 and 1764; every incentive seemed to be wanting among maritime nations at this time. All regions offering immediate return to the explorer had been visited, commercial relations had been established, colonies had been founded, countries rich in precious metals had been conquered, and people rested in the enjoyment of wealth. The time had not yet come when civilised and educated nations would thirst for knowledge, and would send forth vessels to discover what still remained unknown regarding the ocean. In cartography, in the methods of ascertaining the position of vessels at sea, in the observation of the variations of the compass, and of the tides, there had, however, been immense progress in knowledge. The expedition of Edmund Halley in 1699 to improve our knowledge concerning longitude and the variation of the compass must be regarded as purely scientific. The discovery of the quadrant by Hadley, of the sextant by Dolland, the measurement of an arc of the meridian in South America, the appointment of a board of longitude, and the conception of the nautical almanac, all belong to the same period.

Scientific Voyages of Modern Times.—The period which opens with the voyages of James Cook in the second half of the eighteenth century may, however, be considered as the beginning of the scientific explorations of the ocean. Cook was sent at the request of the Royal Society with an astronomer to Tahiti, to observe the transit of Venus across the sun's disc in June 1769. After these observations Cook explored, with every hydrographic detail, the Society Islands, New Zealand, and the east coasts of Australia, which he showed to be an island. Cook's discovery that Australia did not form part of an austral continent excited great interest, and the Royal Society induced the Government to send out a second expedition to settle this question once for all. Cook circum-

navigated the southern ocean in high latitudes, and crossed it in such a manner as to leave no room for the supposition of a great austral continent, unless covered by eternal ice and situated within the Antarctic circle. Cook continued his explorations in a subsequent voyage, during which he lost his life at the Sandwich Islands, and after his time the chart of the Pacific and other oceans differed but little from those of the present day. There have been numerous discoveries towards the North Pole by daring Arctic explorers during the present century, and between 1839 and 1843 Sir James Clark Ross, accompanied by Hooker, conducted an important expedition to the Antarctic, discovering Victoria Land and reaching a latitude of 78° 10′ S.

Cook left little to be done by his successors in regard to the discovery of new lands, but at the end of the last, and during the first half of the present century, a splendid set of sea-voyages took place, many of them accompanied by naturalists, like Kotzebue, Chamisso, Lenz, Darwin, who directed their attention to the physical and biological conditions of the sea, so that these voyages added much to our knowledge of terrestrial physics, of the hydrography, zoology, and botany of the ocean. Down to our own time, however, the observation of oceanic phenomena was limited to the upper layers of the sea, to an examination of the coasts of continents and islands, and a study of oceanic routes useful for commerce, together with a discussion of the winds, tides, and currents, by which these were affected. Our knowledge of the ocean was, literally speaking, superficial. No systematic attempts were made to ascertain the physical and biological conditions of the greater depths: the apparatus necessary for such an investigation had not been invented. We had no definite knowledge of the three-fourths of the earth's surface covered by the waters of the ocean.

Exploration of the Deep Sea.—A new and highly important era in our knowledge of the earth and the ocean opens with the investigation of the deep sea. Sir John Ross in the Arctic, and Sir James Clark Ross in the Antarctic, had made several successful attempts to sound and dredge in deep water. Maury awakened great interest by his soundings in connection with the first suggestions of an Atlantic cable, and Wallich's investigations in the *Bulldog* as to the depth at which life existed in the ocean raised a storm of controversy, which the expeditions of the *Lightning* and *Porcupine* did not completely set at rest. The systematic examination of the great oceans was first undertaken by the celebrated *Challenger* expedition, which in a circumnavigation of nearly four years explored the most profound recesses of the ocean in all regions, enriching every branch of science by its observations. Twenty years ago we were in profound ignorance as to the condition of things in all the deeper parts of the ocean; we had no accurate knowledge concerning more than one-half of the earth's surface. Thanks to the *Challenger* and other deep-sea exploring expeditions of our own time, we now know the movements of ocean water with its temperature and composition in nearly all directions, organisms have been discovered in the ocean throughout its whole extent, and we are in possession of a large body of information as to their nature, distribution, and relations to the shallow-water and terrestrial fauna and

flora. The deep-sea deposits from all oceanic areas have been examined, and the extensions of the different varieties more or less clearly defined, while the chemical changes now taking place on the ocean's floor throw a flood of light on the structure and origin of the solid land of the continents. The contour lines of the great submerged ocean basins have been clearly sketched, the foundations of a more complete scientific physiography of the earth have been securely laid down. We can now form a tolerably accurate picture of the conditions prevailing over the whole surface of our planet. The future historian will doubtless regard the advances in oceanography during the past generation as the most brilliant addition to our knowledge of the earth, the most splendid conquest of man over nature, during the Victorian period. It might be said that the discovery of America and the other great discoveries that mark the end of the fifteenth and the first quarter of the sixteenth century, by doubling at a single bound all that was previously known of the earth's surface, produced effects that are felt even down to our own times. By enlarging the field of researches, observations, and studies, by the impetus imparted to the human mind, they have contributed more than anything else to the marvellous progress of the past three hundred years and to the rapid development of modern civilisation.

The origin of the name given to the New World.—Much has been written about the name *America*, and the controversy as to its origin continues to the present day. It is almost universally believed that the New World was named after Vespucci—a friend and contemporary of Columbus—who made four, or probably six, voyages to America as a pilot, astronomer, or supercargo, and ultimately became Pilot-Major of Spain. He has often been accused of having robbed Columbus of a just reward through giving, or having connived at giving, his name to the New World, but there does not seem to be the slightest evidence that Vespucci had personally anything to do with the naming of the new-found lands in the West. It is often said that the New World should have been called *Columbia*. The name *Christopheria*, after the Christian name of Columbus, has apparently never been suggested, although this would have been quite analogous to adopting the name America from the supposed Christian name of Vespucci. It has not been suggested that *Vespuccia* would have been an appropriate name for the New World, which would follow the general rule of using the family name, as in the suggested name *Columbia*. It cannot be denied that there is something peculiar and fascinating about the question as to why the Christian name of Vespucci should have been adopted for the great continents of America.

The Christian name of Vespucci appears under a great variety of forms, such as *Alberticus*, *Albertico*, *Amerigho*, *Amerigo*, *Americus*, *Americo*, *Amerige*, *Amergio*, *Almerigo*, *Albertutio*, *Morigo*, *Damerigo*, *Emeric*, *Armenico*. Albertutio and Alberticus have evidently been given in error as the first name of Vespucci.[1] Alberigo and Amerigo are two Florentine forms of the same name. This is the same as Americus or Emericus in

[1] Winsor, *op. cit.* p. 543.

Latin (Emmerich,[1] Aimerich in German, Emeric in French). Humboldt argues that this name is derived from the Teutonic name *Amalrich*[2]—the work-ruler—and this is regarded by some writers as a most appropriate title for the new world of labour and progress on the other side of the Atlantic.[3] It has been asserted by Marcou that Amerigo is not a Christian name, and that the Catholic Church would never have given such a name to the infant Vespucci.[4] But this is the name of a well-known saint whose *fête* is in the calendar on the 4th November.

The first suggestion of the name America to be found in literature appears in the passage, quoted below, from a little work entitled, *An Introduction to Cosmography*, published by Waldseemüller, at St. Dié, in 1507. This work was prepared under the auspices of the College authorities of the little town of St. Dié, but it is probable that the principal author was Jean Basin de Sandacour;[5] we know at all events that he translated the letters of Vespucci, which are appended to the book, from French into Latin.

The name appears for the first time on the map of Leonardo da Vinci, about 1514, America being represented as a large island mostly to the south of the equator, and corresponding to what Vespucci regarded as the New World, or fourth part, unknown to the ancients. In subsequent charts the name appears on different parts of South America, while North America is designated by a variety of names. In 1541 Mercator's map has the first two syllables of the word (AME) on the northern continent, and the two last (RICA) on the southern continent, the name being thus applied for the first time to the whole continent of America. This account of the christening of the New World is the one generally accepted.[6]

In the oldest chart but one of the New World—the Cantino map, drawn in Lisbon in 1502, and in the preparation of which Vespucci is believed to have taken part—there is a most suggestive name. Towards Darien, and in the direction of Nicaragua, beyond the furthest point to which the exploration of Ojeda and Vespucci had extended in 1499 and 1500, there appears the word *tamarique*, which may stand for *terra amarique*. The same name is found on the Canerio map, prepared between 1502 and 1504. In the map of Johannes Ruysch, published in 1508, we find at the same place *Tamaraqua*, and then this name disappears from all subsequent charts.

Jules Marcou has pointed out that a little to the westward of this position, in Nicaragua, there is to this day a range of mountains

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[1] Jahrbuch der Naturwissenschaften, 1890-91, p. 414.

[2] *Examen critique*, tom. iv. p. 53.

[3] *History of Christian Names*, p. 260, London, 1863.

[4] Jules Marcou, "Sur l'origine du nom d'Amérique," *Bull. Soc. Géog.*, Paris, 1888, p. 654.

[5] "But now these parts have been more extensively explored, and her fourth part has been discovered by Americus Vespucius (as will appear in what follows): wherefore I do not see what is rightly to hinder us from calling it Amerige or America, *i.e.* the land of Americus, after its discoverer Americus, a man of sagacious mind, since both Europe and Asia have got their names from women. Its situation and the manners and customs of its people will be clearly understood from the twice two voyages of Americus which follow" (Fiske's translation, *op. cit.*, vol. ii. pp. 136, 137).

[6] Professor Horsford attempts to derive the name America from the Norse word *Erick*, which in the mouths of the natives of Vinland became Em-erika=America.

known as *Sierra Amerrique*, and a tribe of Indians called *Amerriques* still inhabit the same region, once a powerful tribe having wide communications.[1] These Indians were known to Belt, the naturalist of Nicaragua, who was for many years engaged in the working of gold mines in the country.[2] Again, Peru is in the same direction to the west from where Tamarique is marked on the Cantino map, and T. H. Lambert tells us that the Sacred Book of the Peruvians shows *Amarca* or *America* to have been the national name of that nation. *Cundin-Amarca* was afterwards the "Golden City," or El Dorado of the Spaniards. Lambert says that the riches of the cities of Peru were so celebrated that the Spaniards must have heard the name Amarca or America from the time of their first arrival at the mouth of the Orinoco.[3] This view seems to be supported by the existence of the name Tamarique on this coast of South America in early maps, as indicated above.

The name Tamarique, possibly as above suggested a contraction for *Terra Amarique*, was probably written on the Cantino map by Vespucci himself; this name may have led Schöner in 1533 to accuse Vespucci of having written his name *Terra di Amerigho* on some charts. Vespucci had visited the coasts of Honduras in his first voyage, and the northern coasts of South America in his second, and must have been deeply impressed with what he had heard of the wealth of the land to the west and south, called Amarca, or the land of the Amariques, on the supposition that these names were in use among the natives as asserted by Lambert. We may suppose that, in answer to the ever-repeated question: Whence came this gold you wear? the Indians pointed to the west, to the country of the Amariques, to the cities of Amarca or America. Vespucci may have spoken much about this region, and urged that expeditions should complete its exploration, for we find him, along with La Cosa, making two voyages to Darien, the first in 1505 and the second in 1507, and on each occasion returning heavily freighted with gold.[4]

Why may not Vespucci have received the soubriquet of America or Americo? By his voyages, by his writings, by his official position as Pilot-major of Spain, he was more prominently associated with the work and wonders of the new world than any man of his time. If it can be shown that the name of America was in use by the Aborigines of Central and South America, as the name of a western country where gold was abundant, then it is most likely to have been a name familiar to the sailor and traveller of the period as a general name for the new lands of the west. It was an age of nicknames. What more natural than that Vespucci should be called America Vespucci? His Christian name of Amerigo would lend itself to, or even suggest, the nickname. It is possible that the new world may have given Vespucci his celebrated name of Americus, and not Vespucci his Christian name to the new world. Waldseemüller or Jean Basin, when making the famous suggestion as to the name of the new world, may have had some suspicion

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[1] Marcou, *op. cit.* [2] Thomas Belt, *The Naturalist in Nicaragua*, London, 1874.
[3] *Bull. Amer. Geog. Soc.*, 1883. [4] Fiske, *op. cit.*, vol. ii. p. 175.

that America was a native name, and the fact that it was so may have principally conduced to the suggestion and its subsequent adoption. The name Chinese Gordon might be cited as a parallel example. The process of nicknaming is not yet extinct; for the last ten or fifteen years the writer has been frequently called, in familiar conversation, Challenger Murray. It is given in a half-playful manner by all sorts of people, when there is no necessity for distinguishing the writer from some other Murray. The name America may have been widely used among sailors of the fifteenth century, and no traces have been preserved in the literature of the time other than this nickname of Vespucci and the name on the Cantino chart.

ON THE NEW MAP OF PERSIA.

By Hon. George Curzon, M.P.

In the September number of this magazine there appeared a criticism, from the pen of Dr. James Burgess, of the map of Persia which I constructed, in conjunction with Mr. W. J. Turner, for the Royal Geographical Society in 1892, and which was attached to my book on Persia, as well as published and sold separately for the Royal Geographical Society by Messrs. Stanford. Dr. Burgess is kind enough to speak in terms of general appreciation of the map, as greatly superior to any of its predecessors; but nevertheless he submits it to a hostile criticism in particulars, which is both minute and interesting. I think, however, that it will be easy for me to give Dr. Burgess an answer on all the points that he has raised, while on some of them I shall show that he has himself fallen into almost inexplicable error.

His first general complaint is that I have not published a full list of the positions, with their latitudes and longitudes, which I have assumed as fixed by virtue of their scientific determination. The reply to this objection might, I should have thought, easily have been inferred from a passage in my accompanying memorandum, which has been quoted by Dr. Burgess himself:

"The presence of the Indo-European Telegraphic Staff has availed to determine the latitude and longitude of important centres; but over the bulk of the country surveys have been conducted with such instruments as independent travellers happened to possess, chiefly with plane-tables, sometimes with the aid of prismatic compasses, traverses, or astronomical observations; the nature of the instruments employed not being stated in every case. The result is that Persian surveys so far constitute a sort of medley or patchwork, the same scale not being uniformly observed, and the observations of different travellers failing to correspond. Scientific precision, therefore, cannot as yet be predicated of any Persian map-making; and future labours will doubtless disturb several of the conclusions at which we have arrived."

In other words, few, if any, positions in Persia have been fixed with

positive scientific exactitude except upon the coast, and upon the Indo-European Telegraphic lines. The rest of the map, as I indicated clearly enough, is the result of the working-out and correlation of an immense number of surveys and route-maps, several of them unpublished, and depending upon data necessarily differing very considerably in scientific value. Keith Johnston, no doubt, made use of the best materials that were accessible in his day; but the reason of the displacement which Dr. Burgess notices in so many positions on the new map is that the information that was available in 1864, the date of the *Index Geographicus*, is now almost wholly superseded; and that our new map is constructed for the most part from observations and surveys made since that period.

Dr. Burgess next takes up the question of orthography, upon which I may remark in passing that no two authorities, when dealing with the transliteration of Oriental terms into the symbols of the English alphabet, will ever be found wholly to agree. Upon one point his criticism is sound. There are a number of cases in the map as printed, in which the explanation of differing local usage can hardly be held to justify the different spelling of the same name. Such, for instance, is the appearance of the two forms, *safed* and *sefid* (white), and several others among the cases noted by Dr. Burgess; although it is remarkable that, while passing this very criticism upon me, he himself on page 458 admits of the double spelling *nau* and *no* (new). As regards the spelling *sefid* or *safid*, I may say in passing that I have intentionally preferred the former, as better representing the short vowel sound, since according to the Royal Geographical Society rules *safid* should be pronounced *sah-feed*, which is wrong.

The explanation of the incongruities above alluded to is this. When the map was originally drawn, the great number of names (nearly 5000) upon it rendered these mistakes difficult of detection, until the alphabetical index had been drawn up, whereby their existence was at once revealed. I thereupon revised the entire list, with a view to their removal, but learned that the map had meanwhile been engraved, and that it was too late to effect the desired amendment. I may add, however, that the index has since been carefully revised by Sir F. Goldsmid and myself, as the nucleus of a contemplated scheme of common orthography; and that, should a later edition of map or index be published, there will be a considerably greater approximation to the ideal of uniformity.

In his list, however, of the discrepancies which he alleges my index to contain, Dr. Burgess falls into an error which, though trifling, I am yet at a loss to explain. Among the names which he cites as appearing in the index are Fathabad, Iskandarabad, Gishun, Jafarbair, Kuhun, and Kadj. Not one of these occurs in my index. As regards Kadam and Kudum (*Kuh-dum*), Dr. Burgess surely knows that they are different words.

Further, when Dr. Burgess proceeds to positive suggestion himself, he ignores the application, in a work prepared and issued by the Royal Geographical Society, of the very rules of that Society which he elsewhere criticises me for having only imperfectly observed. Thus he prefers Qain to Kain, though he will see among our published rules,

"*q* should never be employed; *qu* is given as *kw*." Again, he repudiates Meshed *vice* Mash-hed, though I had taken particular trouble to explain that I so spelt it, not because it was correct, but in deference to Rule 2 of the Royal Geographical Society: "No change is made in the spelling of such names as have become by long usage familiar to English readers." He rightly prefers Rey to Rhé, which he will find corrected in my book; but when he suggests the alternative spelling Rai, he again forgets the Royal Geographical Society's rule which says, "When two vowels come together, each one is sounded," and "*ai* is pronounced as in *aisle*."

Dr. Burgess next supplies a list, which he says it would be a help to the cartographer to have before him, of the elements that enter into the composition of so many Persian and Arabic names. If he will look toward the left-hand corner of my map, he will see that of his suggested list fifteen are already there printed in a table introduced for the purpose, as well as nineteen others which he has not mentioned.

Dr. Burgess goes on to criticise the absence of certain names familiar in ancient history, such as Tabaristan and Salamas. As regards the former, I intentionally omitted place or district names which are now entirely obsolete. A modern French map does not, as a rule, mark Aquitaine. A modern English map does not indicate Mercia or Wessex; and if Tabaristan were to be inserted, why not equally Hyrcania, Bactria, etc.? As regards Salamas, Dr. Burgess is mistaken. He will find Salmas on my map in lat. 38° 9′, long. 44° 40′.

Dr. Burgess then criticises the scale adopted. It is easy enough to say that a large scale is better than a small scale, and that 48 miles to the inch admit of greater clearness than 60 miles. Of course they do. The propositions are self-evident. But what is the good of the Royal Geographical Society preparing, as it is doing, a series of new maps of Central Asia, if each is to appear with a separate scale of its own?

Dr. Burgess's remarks about the index are surely not less hypercritical. He first complains that the index only indicates the square in which the required name is to be found. Does the index of a book ordinarily do more than refer the reader to the page? Does it give him the line and the place in the line where the reference occurs? And are the students of a map incapable of finding a name within the four corners of a space less than $2\frac{1}{2}$ inches long by 2 inches broad? Next, although he is aware of the lack of scientific exactitude in the majority of the geographical positions, he complains that the latitude and longitude of each are not given. Thirdly, he quotes Keith Johnston's *Index Geographicus* as a model index, combining the system of squares with that of geographical values. Yes; but the very reason why that work has been discontinued is because, in dealing with a little-known country like Persia, it is found in a few years' time to have become wholly unreliable. What would have been the use of publishing a minute list of all the geographical co-ordinates in my map, only to find out later that a large number of them were inexact, like those in the *Index Geographicus*?

Finally, in his curious table of comparison between the latitudes and longitudes of the new map and of two well-known mediæval astronomers,

Dr. Burgess once more comes to grief over Salamas. He first says that it is wanting in the new map, whereas I have already indicated its existence and position there, in a site almost exactly corresponding to the figures in brackets given by Dr. Burgess, who can scarcely, therefore, have overlooked it. He then says that Salamas in Keith Johnston's *Index Geographicus* appears in the last-named position. It does nothing of the kind. Neither Salamas nor Salmas appears either in the *Index Geographicus* or in the *Royal Atlas.*

Again, when, on p. 455, he wonders whether my Naubanjan is really meant for the Naubinjan of Keith Johnston's map, and asks what has become of the latter, I reply that certainly it is not the same, and that what has become of Keith Johnston's Naubinjan I know not, since I am doubtful whether it ever existed—a doubt which its sponsor appears himself to have shared, since it is expunged from the later editions of the *Royal Atlas.*

I have now answered each of the points raised by Dr. Burgess in his paper, to which I am grateful for the permission here accorded me to reply.

Dr. Burgess's Answer.

As regards positions scientifically fixed, Mr. Curzon's answer is quite beside the mark. My contention was that all such points, be they many or few, on the Telegraph line, coast, or elsewhere, should have been indicated and their co-ordinates given, that future travellers might know on what points to base their surveys, and to aid in further correction of this map.

Mr. Curzon has yielded the principle I contended for as to spellings. I have again and again protested against the Royal Geographical Society's rules as unsatisfactory in certain details—*ante*, vol. viii. pp. 25, 28—and therefore am perfectly free to suggest spellings which are not in accordance with them. Nor did I find fault with Mr. Curzon for breaking the Royal Geographical Society's rules, but only for want of adherence to any regular system.[1]

To compare Tabaristân with Hyrcania, Bactria, etc., Mr. Curzon must know is straining a point for effect. The latter are purely ancient and classical, whereas the former is still used in Persian books.

Students are no doubt capable of "finding a name within the four corners of a space less than 2½ inches long by 2 inches broad," but their labour would be considerably lightened had they to search in a square containing not more than twenty or thirty names, instead of one representing 16,000 square miles of country, with fifty to seventy finely engraved names.

My notes of discordant spellings were jotted down in pencil long before I wrote the paper; I had not time to verify them, and have since noticed some mistakes. Isfand*a*rabad should have been compared with Iskand*e*rabad; G*e*sh*a*n with G*i*sh*a*n; Kuch*e*n with Kuch*a*n. I also regret that in copying from a rough manuscript I transferred the position of Sâlamâs from the wrong column; it is not in Keith Johnston.

[1] If Safid is to be pronounced *Sah-feed*, is Sabil to be pronounced *Sah-beel*? Or may not Sefid be pronounced *Say-fid*? If *kw* stands for *qu*, what is to stand for *qa*, *qo*, etc.?

In conclusion, I may say that the objects of my remarks were to further uniformity in spelling Oriental place-names; to urge the desirableness of publishing the fresh data on which good maps like that of Persia are constructed, and so provide for further corrections; and to make them easier of reference. JAMES BURGESS.

OBITUARY.

"When a man dies, they who survive him ask what property he has left behind. The angel who bends over the dying man asks what good deeds he has sent before him." — *Koran.*

WE regret to announce the death of Emin Pasha, which is said to have occurred about the end of December 1892, not far from Nyangwe, to the east of the Congo. The account of his death is curious. He is said to have been beheaded by an Arab, which is improbable, and eaten by cannibals, which is still more so. Still, as from east and west and south news has come of his death, and as his diary and papers have been secured by an official of the Congo Free State, we are justified in assuming that he is no more. It is somewhat strange that his death is surrounded by mystery, as was that of his chief, General Gordon.

As during the past few years Emin Pasha's name has frequently appeared in this journal, it seems only appropriate that some notice of his life should be given. Our pages being occupied with scientific matters, we shall only refer to the deceased with regard to his scientific work, not because "*de mortuis nil nisi bonum*," but because "*on doit des égards aux vivants; on ne doit aux morts que la verité.*"

Nor would it be seemly here to enter into personal and political matters, which it would be necessary to do were we to refer to Emin's character in full.

On the 28th of March 1840, Eduard Schnitzer was born in Oppeln, in the Prussian province of Silesia. He was the son of Ludwig Schnitzer and his wife Pauline. His father was a small merchant, and both father and mother were Jews, but appear, whether before or after their son's birth is not clear, to have embraced the Lutheran religion. At any rate, the subject of our notice was baptized as a Christian when six years old. His father died many years ago; his mother died in 1889, but a sister of Emin's lives at Neisse. The lad was educated in the Gymnasium of Neisse; he commenced the study of medicine at Breslau in 1885, and graduated in Berlin in 1864. As a boy, he was distinguished by a love of natural history. Soon after graduation he went to Turkey, and entered the staff of Vali Mushir Divitji Ismail Hakki Pasha, with whom he travelled as medical officer, obtaining an intimate acquaintance with Armenia, Syria, and Arabia. In 1873 he was in Constantinople, where Hakki Pasha died, and he appears to have remained there occupied in the practice of his profession until 1875, when he visited his family for a few months. Preferring a roving life, he went to Egypt, and after various vicissitudes was sent to the Equatorial Province of Egypt as medical

officer, Gordon Pasha being Governor at the time. Gordon not only utilised him in a medical capacity, but employed him upon several diplomatic missions, and sent him on various tours of inspection throughout his provinces. In 1878 Gordon Pasha, being then Governor-General of the Sudan, appointed Emin Governor of the Equatorial Province of Egypt.

During these years he had been engaged in learning a number of languages—French, Italian, Turkish, Arabic, as well as several Slavonic tongues—and he also commenced those meteorological, geographical, botanical, philological, and ethnographical studies for which he will always be remembered with admiration, long after speculation has ceased as to whether he was more of an enthusiast or weakling.

Much speculation has been caused by Eduard Schnitzer's adoption of the Turkish name of Emin; but this is not very mysterious, as it has frequently been done by others for the sake of obtaining an unhampered entrance into the Mohammedan world. Writing in 1871, he said to his sister: "I have quickly gained a reputation as a doctor. This is due to the fact that I know Turkish and Arabic as few Europeans know them, and that I have so completely adopted the habits and customs of the people that no one believes that an honest German is disguised behind a Turkish name. Don't be afraid; I have only adopted the name, I have not become a Turk." It is also a fact that in the Equatorial Province he supported, as did Gordon Pasha, the Mohammedan religion, which was the religion of the country, and, we believe, attended the mosque on Fridays and kept the fast of Ramadan; but what his real religious convictions were we do not know, and indeed we have no right to inquire. One thing, however, may be gathered from his writings—his belief that "religion lies more in walk than in talk."

It is now time to give a few details as to the contributions made to science by Emin Pasha. From 1878 to 1883 he surveyed no less than 4000 English miles in detail, and his province was far more reliably mapped than Darfur and Kordofan, where a large staff of surveyors were engaged in the work. In our own journal he published an account of his survey of the Albert Nyanza, and described the discovery and exploration of the hitherto unknown Semliki river. After leaving the Equatorial Province, he mapped the route to Bagamoyo, and together with Dr. Stuhlmann made route surveys from Bagamoyo, round the south and west of the Victoria Nyanza, to the south of the Equatorial Province again; but the importance of this work cannot be estimated until the publication of the maps, which will take place before the end of this year. With regard to meteorology and climatology, we may quote the opinion of Professor Hann of Vienna, who wrote some time ago:—"In my opinion, no one can compare with Emin in the amount he has done, entirely unaided, for the climatic investigation of a country which was quite unknown before his residence in it. His perseverance for so many years in making meteorological observations three times a day, and with scientific accuracy, is simply wonderful. Nothing was known of the meteorology of this part of Central Africa before he worked there, and as the result of his diligence Lado has become the point to which all baro-

metrical observations of heights in East Equatorial Africa are referred. . . . The science of meteorology will ever owe him the greatest thanks for his work." Emin's meteorological journals contain observations for over ten years.

Probably no one has been such an industrious collector of mammals, birds, reptiles, butterflies, etc., as the subject of our sketch; and, as Mr. Oldfield Thomas, of the British Museum, wrote, "no tribute can be too high for a man who, with the cares and troubles incidental to such a position, could find time systematically and steadily to prepare for scientific examination such an enormous mass of material, which science generally, and British scientists especially, owe to the enthusiastic naturalist, Emin Pasha."

Emin's industry in collecting vocabularies in the various districts in which he resided was very marked, and his studies in anthropology have been varied and accurate. He has described with great detail and insight the habits, customs, and folklore of the native tribes with whom he has come in contact; and we can only deeply regret that in all probability much of this work has been lost, although in Dr. Stuhlmann's forthcoming work there will be several chapters from his pen.

We must not, however, lengthen this notice. Almost every branch of science is indebted to Emin's work; and though in recent years fate has not been kind to him, and untoward circumstances have come between him and popular appreciation, yet as time rolls on the value of his scientific achievements and the innate goodness of his character will become more and more evident.

Emin Pasha was a Fellow of numerous scientific societies on the Continent. He was a corresponding member of our Society, and also of the London Anti-Slavery Society. He was awarded the Patrons' or Victoria Medal by the Royal Geographical Society of London in 1890, "in recognition of the great services rendered by him to geography and the allied sciences by his explorations and researches in the countries east, west, and south of the Upper Nile, during his twelve years' administration of the Equatorial Province of Egypt."

We are able to give the following extracts from his field-book, being the last notes entered in it :—

"Left the Manyema establishment on the Ituri, 29° 50′ E. long., 1° 22′ N. lat., on May 29th, 1892, and arrived at Ipurungu, Chief Amkuda, the same evening. Distance 27-28 kilom. NNW. Virgin forest.

June 10*th*, 1892.—Indekaru village.

Aug. 1*st*.—Left Ipoto for Urumbi, another Manyema establishment in the forest. *En route* for the Ituri, which we are to cross.

Aug. 9*th*.—By the negligence of our Manyema chief, all my collections have been lost in the river Tunda, which we had to cross in a canoe. What a pity! On the banks of the Tunda (Lunda) virgin forest.

Aug. 20*th*.—After nineteen days' march through the forest, arrived at the station Urumbi, the most western point of the journey; the route now runs southwards as far as Kirundi (Kibenge's) on the Upper Congo, where M. Bohndorff has made collections before me.

Aug. 27*th*.—We cross the Luidi, and camp at Maliasive on the western bank.

Aug. 28th.—We leave the Luidi for a march of eight days through the forest.

Sept. 7th.—We arrive after a toilsome journey at the post of Ubiere ; one day to spend here. From Ubiere another march through mud and water to Utete, Urumbi, a village abandoned by its inhabitants, in the midst of immense banana groves, surrounded by very dense forest. Here provisions must be collected for a journey of ten to twenty-one days to Kenene, whence the Congo may easily be gained in ten short days' marches. Every one gathers bananas, which, dried and pounded, form our sole nourishment. We can obtain neither fat nor meat. Our last halting-place before coming to the Congo was reached on October 12th, 1892. It is Muyomema, usually called Kenene, the name of the chief, a drunken Unyamwezi slave of Said bin Abed."

GEOGRAPHICAL NOTES.

By W. A. Taylor, M.A., F.R.S.E.,

Librarian, R.S.G.S.

EUROPE.

Lake Windermere.—Dr. H. R. Mill and Mr. E. Heawood completed their sounding of Windermere in September. The lake is more than 10 miles long, and in some places over a mile in breadth. It consists of three natural divisions, of which the northern is 4 miles long, with an average width of $\frac{3}{4}$ mile. The east coast, facing the prevailing wind, is much eroded by wave action. This section is the deepest, soundings being obtained down to 219 feet, and there is reason to believe that the maximum depth is 20 to 30 feet more, but the patches where these greater depths are to be found must be of very small extent. The area below 200 feet measures 1 mile by $\frac{1}{4}$, and the area below sea-level $3\frac{1}{4}$ miles long by $\frac{1}{3}$ mile, on an average, in width. The surface of the lake stood at 129 feet above sea-level. The central division is one mile long by half a mile in breadth, and is divided by Belle Isle into two narrow channels where the water is in general less than 25 feet deep. Were the water to fall 16 feet a ridge would be exposed, running from shore to shore. The southern division has a length of $5\frac{1}{2}$ miles, and an average width of $\frac{1}{2}$ mile. The greatest depth in this section was 144 feet. Two hollows lying below sea-level, a mile by $\frac{1}{3}$ mile and $\frac{1}{2}$ mile by $\frac{1}{6}$ respectively, were discovered here. Stiff plastic clay covers a large proportion of the bed of Windermere, and all the rocky promontories show signs of ice action.—*Geogr. Journal* October.

The Population of Spain.—Some of the results of the Census of 1889 have now been published. Among the most remarkable facts brought out by the Census is that out of the 17 million of inhabitants in Spain, 8,727,519, or about half, have no profession. The most numerous class is the agricultural, containing 4,854,922 persons, and the official class is also very large, with 97,257. Of mendicants there are 91,226, the majority being female ; priests and monks number 43,528. The statistics of instruction are not very gratifying. The number of persons who can read or read and write is 5,004,470, and therefore the remainder who are totally illiterate reach the enormous number of about twelve millions.—*Geografia per Tutti*, July 15.

The Census of Austria-Hungary in 1890.—The *Mitth. der k.k. Geogr. Gesell. in*

Wien, Bd. xxxvi. No. 6, give some of the chief results of the census of December 31, 1890. The total number of inhabitants amounted to 23,895,413, whence it appears that the increase during the ten years 1880 to 1890 was 1,726,745, or 7·79 per cent. In Lower Austria the increase was greatest (14·21 per cent.), and least in Tyrol (·94 per cent.). The population is composed of 11,609,456 males and 12,138,636 females. The excess of females is greatest in Carinthia, Carniola, Trieste, Bohemia, Moravia, and Silesia, while only in Görtz and Gradisca, Istria, Dalmatia, and Bukowina do the men preponderate. The number of persons over six years of age who have no education is 6,029,215, being 27·77 per cent. of the males, with 31·08 per cent. of the females. There has, however, been great progress during the decade. German, the Slav dialects of Bohemia and Moravia, Italian, and Magyar have lost ground, while the other languages used within the Empire are spoken by a larger number of people than in 1880.

The Kanin Peninsula.—This peninsula, which is situated at the entrance of the White Sea, consists of a *tundra* interrupted by hills of sand and loam, which sometimes form regular chains. On the coast a terrace containing shells rises to a height of 20 to 65 feet above sea-level, and indicates that the sea has retreated since the Post-Pliocene period. Large elevations are found only in the northern part of the peninsula, stretching from Kanin Nos south-westwards to Cape Mikulkin, but these seldom exceed 800 feet in height. Denudation has in many places removed the ridge, forming plateaus, and leaving only here and there the solid rock exposed. This consists of gneiss and slates with Carboniferous and Permian formations at the edges, covered over with Post-Pliocene deposits. The geological formation of the peninsula shows its former continuity with Timan across the Tcheskaia Bay. As regards the nature of its surface, the country falls into three divisions. The northern part reaches from the Kanin Kamen (the mountain range) to the mouth of the Bugranitsa and Dvoinitchaia, and contains the summer pastures of the Samoyedes. Permanent ice here lies to a depth of 14 inches. The middle portion, extending to the great ness (C. Mikulkin), is covered with *tundra* of moss, birch, and willow. The southern division is a transitional region between the *tundra* and the northern edge of the forests, on the parallel of Semsha. There is a great difference in the flora on the northern and southern slopes of the hills, the latter being rich in vegetation. The interior of Kanin is abundantly watered ; lakes, rivers, and large and wet *tundra* are very numerous. 120 rivers enter the sea, most of them flowing east or west. Many of them form bays at their mouths, probably owing to the great changes in the sea-level, for the tidal-wave attains a very considerable height.—*Deutsche Rundschau*, Jahrg. xx. Heft 11.

Irrigation Works in Russia.—On April 19th General Annenkoff read a report before the St. Petersburg Geographical Society on the work accomplished under his supervision in South-eastern Russia. The failure of crops, which has of late caused so much distress in this part of the Empire, has been due to a constantly increasing scarcity of water. From his own observations, confirmed by the experience of others, General Annenkoff came to the conclusion that this scarcity does not originate from a deficient rainfall. At certain seasons there is plenty of water, but it flows away too quickly, especially in spring. During the last ten years all natural obstacles, as sandbanks and rapids, which retarded the flow of the water, have been removed from the rivers in order to facilitate navigation. Much the same results followed the blasting operations in the bed of the Rhone below the Lake of Geneva. In spring the neighbouring country was inundated, while in summer great drought prevailed. To remedy the unfavourable condition of the water-supply in Russia, General Annenkoff decided that the formation of pools would be the most advisable

means, and he commenced his work in the basin of the Don. Such pools had already been constructed in this country, but nearly half of them were in a neglected state. These were repaired and new ones excavated. In the source-region of the river dams were constructed to facilitate the collection of the spring waters and prevent their flowing off. Breastworks were also erected to guide falling masses of snow into one place, whence their water might be conducted into larger basins. —*Deutsche Rundschau*, Heft 9.

The Crimea.—*Deutsche Rundschau*, Jahrg. xv. Heft 1, contains some interesting results from explorations in the years 1887 and 1888. The most abundant springs of the southern slope of the Crimea rise in the forest zone of the Taurian mountains at an elevation of 1200 to 3130 feet. Those that lie at higher elevations yield little water and are dry in summer, as also those which issue from the ground below 1150 feet. The forest zone not only contains these sources, but also serves as a reservoir for all the moisture which is eliminated from the atmosphere in the form of mist, dew, rain, and snow, and protects the ground from evaporation. It has also a most important influence in modifying the temperature of the mountain slopes and acting as a condenser of the humidity in the lower strata of the air.

It is, therefore, of peculiar value to the cultivation of the district, and, were it destroyed, the coastal strip of the Crimea would be transformed from an extremely fruitful country into an uninhabitable desert. The breadth of the forest zone varies from 2 to 3 miles. The lower part of the forest, consisting of oak, beech, walnut, ash, and maple, begins at an altitude of 1150 feet, and extends up to 2590 feet. Above this a forest exclusively of birch extends up to an average elevation of 3770 feet on the southern slope, and 4080 feet on the northern.

Observations extended over fifty years show scarcely any variation in the mean annual temperature of the air on the mountain slopes. The mean annual temperatures of the air on the southern slopes and the temperatures of the springs, which agree with those of the air, afford data for the construction of a scale of the decrease of temperature for every 100 mètres (328 feet) from 300 to 1000 mètres (984 to 3280 feet).

The thermometer gradients are as follows :—

300 to 400	mètres,	1·2 C.
400 to 500	„	1·0 C.
500 to 600	„	·8 C.
600 to 700	„	·7 C.
700 to 800	„	·6 C.
800 to 900	„	·5 C.
900 to 1000	„	·4 C.

Here it is seen that the temperature of the air on the mountains, just as in the open atmosphere, diminishes in two unequal arithmetical progressions. The fall is more rapid in the lower strata than in the upper.

ASIA.

The Province of Samarkand: its Products and Capabilities.—M. V. Dingelstedt, Corresponding Member of the Society, has kindly sent us the following :—"It is well known that the town of Samarkand, situated at the foot of Mount Choban-ata, in a plain of exuberant fertility, watered by the river of Zarafshan, the most important tributary of the Amu or Jihun, was in the 14th century the capital of the great Tartar empire of Timur. It has continued to be the centre of Mohammedan

learning in Central Asia ; it still contains some magnificent buildings, and enjoys a wide renown, but its days of splendour and magnificence have long since passed away, and it is now only a shadow of its former self. The destiny of man and all that concerns him has, not without some reason, been likened to a wheel, and it is not impossible that the glorious capital of Timur may one day awaken to new splendour, though perhaps of another kind. The Russians took possession of Samarkand a quarter of a century ago, and they have already done something to raise it from its fallen state. The ancient town is now connected by a railway with the Caspian Sea, and through it with the whole civilised world ; it enjoys greater security, a more orderly administration, and a higher degree of well-being, and is more densely populated than in the days preceding its incorporation with the Russian Empire. Were Mr. Vambéry to visit it again, as he did in 1863, it is not impossible that he would retract some of the hard prophecies he pronounced then as to its future mournful destiny.

"Not content with Samarkand as the terminus of their Transcaspian railway, the Russians are now busily engaged in a project to unite it by a railway with Tashkend, and thus give increasing facilities for the commerce and industry of this, in so many respects, highly interesting, but long-neglected, corner of the globe. This undertaking, in conjunction with some other projects for extending and improving the irrigation works in the valley of Zarafshan, gives a particular interest to the province of Samarkand at the present moment. The subjoined statistics, relating to the agricultural and industrial activity of the Samarkand Province, are taken from Russian official publications, and may be not without interest for those readers of the *Magazine* who concern themselves with Central Asiatic questions. The figures given in this report are by no means high, but they tend to increase, and therein lies their special interest. The Russians are gradually realising the importance of their Central Asiatic possessions, and have made serious efforts to stimulate the production of such valuable fibres as cotton and silk, which cannot be cultivated in Russia proper, and which are always sources of prosperity. The total number of the population in the province is estimated at three-quarters of a million, in which are comprised about 700,000 Tajiks and Usbeks and 11,000 Russians, the remainder being made up of Jews, Kirghiz, Hindus, and Persians. The principal industry of the country is agriculture, with its branches of horticulture, viticulture, and sericulture. Agriculture is carried on only where the soil is artificially irrigated. According to official statistics, the crops of 1891 produced about 24,849,480 bushels of cereals (wheat, rice, and barley), and wine and grapes to the value of some 1,640,000 rubles. The production of silk, which is a very old industry of the country, was for a long time steadily declining ; but since 1891, thanks to certain facilities afforded by the local Government for the acquisition of healthy eggs and the erection of model incubators, as also to some improvements in the traditional method of rearing the silk-worm, this important industry has begun slowly to rise again. The crops of 1891 amounted to 405,540 lbs. of cocoons, which yielded 43,259 lbs. of raw silk and 12,708 lbs. of waste and husks. The average prices for silk have varied from 12 to 22 rubles a *pood* (about 8d. to 1s. 3d. per lb.) of cocoons ; from 115 to 360 rubles for a *pood* (6s. 5d. to 20s. per lb.) of raw silk ; and from 36 to 95 rubles (2s. to 5s. 3d. per lb.) for the same quantity of husks and waste. In 1891 there were about 451 small silk-factories (*filatures*) in activity, with a total yearly output of the value of a quarter of a million rubles. The reeling apparatus is generally of the most simple construction. Next after agriculture proper comes the cotton industry, for which the soil and the climate are eminently adapted, and which waits only for the extension of irrigation to make rapid progress. The area of the cotton-fields tends to increase, but as yet slowly ; in 1890 there were 46,839

acres of land under cotton, and in 1891 this number had risen to 55,736. The quality of the cotton is also improving, for the indigenous cotton-seeds are being steadily supplanted by American seeds. The crops of 1891 yielded 36 million lbs. of cotton, of which one-half—that is, 18 million pounds—were from American plants. The average local prices for cleaned American cotton have ranged from six to seven rubles a *pood* (4d. to 4¾d. per lb.), and for indigenous cotton from four to five rubles a *pood*. Raw cotton has been sold, according to quality, from 1 ruble 20 kop. to 1 ruble 60 kop. a *pood*. The gross yearly receipts for raw cotton have been officially estimated at one and a half million rubles (£150,000). The export of cleaned cotton in 1891 was valued at 200,000 rubles (£20,000). There are fifteen cotton-gins in operation.

"The above, with sheep-breeding, are the staple industries; but besides these there are found in the province, once under the immediate sway of the great Timur, some manufactories of raw material—cotton, wool, and skin—into more finished articles, and there are also a few distilleries and breweries. These manufactories are certainly not very important, but their total yearly production has been officially estimated at two million rubles.

"The province of Samarkand is also rich in various minerals; coal mines have been found, beds of graphite, plumbago, lapis-lazuli, and also deposits of gypsum, limestone, chalk, and rock-salt, but the exploitation of this mineral wealth is as yet in its infancy. The principal obstacles to the natural development of such sources of wealth are want of money and the very backward condition of the roads. Four coal-mines are actually worked, which give yearly about 6500 tons of coal, consumed principally on the Transcaspian railway. It is confidently expected that with the extension of railways the production of coal will considerably increase.

"The commerce of the province is as yet not very active, but it shows signs of expansion. The value of the yearly exports into Bokhara and Russia is estimated at six million rubles; they consist of wheat, rice, fruits, wine, beer, cotton, wool, leather, silk, and wine. The yearly import of manufactured goods from Russia into Turkestan is estimated at 14 million rubles."

Perak.—The following notes have been extracted from *The Perak Handbook and Civil Service List for* 1893, a most useful publication, now in its second year of issue. The state is situated between lats. 3° 37′ and 6° 05′ N., and longs. 100° 23′ and 101° 51′ E., and has an estimated area of 10,000 square miles, or 6,400,000 acres. Of these 1,451,770 acres are situated at a height exceeding 1000 feet, and are suited for the cultivation of chinchona, tea, coffee, etc., below which 588,422 acres are available for crops of Liberian coffee, tea, cocoa, cardamoms, etc. The population amounts to 214,254, of which 156,408 are males, and only 57,846 females. Besides the aborigines, now numbering less than 6000, the population is made up of Malays (96,719), Chinese (94,345), Tamils (13,086), Bengalis (1755), Javanese, etc. (1483), various races undescribed (428), Europeans (366), and Eurasians, Jews, and Armenians (293). The town of Taiping, the capital, is inhabited by 13,304 persons. The figures for the aborigines, however, are confessed to be too small, as no enumeration of the tribesmen inhabiting the more inaccessible portions of the State was found to be possible. They consist of two tribes, the Sakai and Semang; they are excessively shy and retiring in disposition, perhaps owing to their former subjection to the Malays. The Sakais, who number 5091, are described as short, but the men are sturdily built, and lighter in colour than the Malays. Their long, black, wavy hair stands out from the head, and is often artificially coloured a yellowish brown. Their only attire is a strip of cloth and some rude ornaments. The blow-pipe, with its poisoned darts, and bamboo-pointed spears are the favourite

weapons, and these, as well as their domestic utensils, are often decorated and carved in an elaborate manner. The Semangs (688) are scattered over the country to the west of the Perak River : they are smaller and darker than the Sakais, with close, curly, black hair, and use bows and arrows in addition to the blow-pipe. They do not raise crops, but live on fruits, leaves, and roots, and on the animals they capture in the chase. They have no permanent dwellings, but wander over their territory from place to place. In neither tribe is there any idea of a divinity, but good and evil spirits are believed to exist. The Semangs are partial to manufactured tobacco, but when it is not to be had they chew the green leaves of the plant. (See vol. viii. p. 383.)

Perak is well watered by several rivers and numerous smaller streams. The Perak River is the chief waterway, and is navigable by steamers of between 300 and 400 tons for 40 miles above its mouth, and for 165 miles by cargo boats. The upper reaches are full of rocks and rapids, and can only be navigated by small boats and rafts. The river's course is mostly from north to south, until it turns sharply to the west and falls into the Straits of Malacca : the Kinta, Batang Padang, and the Plus are the principal tributaries, and are all open for the passage of cargo boats. The Bernam River is navigable for steamers to a point 100 miles above its mouth, which has a width of two miles. Other rivers are the Dinding, Bruas, Larut, Sapetang, Kurau, and Krian. The mountains form two principal chains (generally running in a north-west and south-east direction), with several outlying groups, and attain an altitude of between 7000 and 8000 feet. Gunong Kerban, probably the culminating point, has lately been ascended by Mr. G. A. Lefroy, who found its height to be 7127 feet (see *Geog. Journal*, Aug.). The climate is fairly good, the temperature ranging on the low ground from 60° Fahr. at night to 96° Fahr. during the heat of the day. The nights are always cool. At a height of 3000 feet the night temperature rises to 65° Fahr., and that of the day falls to 73° Fahr. The rainfall appears to be unequally distributed, but the average is perhaps 90 inches, although 200 inches have been registered at Taiping. There is no true rainy season, but the precipitation is greatest in March, April, May, October, November, and December.

Owing to the cheapness of living and the sparsity of the population, not much land is under cultivation. Rice is the staple crop, but yet the imports of this article (in 1891, valued at 1,498,461 dollars) exceeded the exports (valued at 191,088 dollars). Indian corn is also raised in considerable quantity, but the heat of the climate is against its full development, one or two cobs being, as a rule, the produce of each plant. Sweet potatoes, yams, caladium bulbs, cassava, and other roots and vegetables are produced in sufficient quantities to meet local wants, and onions, lettuce, beans, egg-fruit, cucumbers, pumpkins, and vegetable marrows grow freely. Among fruits the mangosteen and durien are prominent productions, and mangoes, langsats, machangs, tampunei, rambei, shaddocks, rambutans, pulâsan, papaya, guavas, pine apples, dukus, tampunei, bananas, plantains, water melons, limes, oranges, jack fruit, custard apples, and sops are grown, but the want of a fruit that can be properly cooked is felt. Bark, used in tanning, rattans, bamboos, cotton, sugar, coffee, tea, cocoa, betel nuts, indigo, tobacco, gambier, pepper, incense, camphor, and dammar, india-rubber and gutta-percha, are cultivated to a limited extent, or grow wild. Potatoes and other European vegetables do not thrive, and can be cultivated only on the higher grounds.

Tin is the principal mineral, and in 1891 was exported to the amount of 241,962 pikuls. Gold occurs, but nothing has been done to properly test the extent of the deposits. Lead has been worked, and is expected to turn out well, silver being sometimes quite conspicuous in the ore. Iron has been found, but the absence of

coal makes it impossible to mine it with the prospect of a fair return. Copper, bismuth, arsenic, mercury, manganese, and plumbago are all known to exist. Zinc has lately been discovered, and tungsten is expected to prove a valuable product in the near future. Economic rocks and earths include sapphires, garnets, topazes, marble, granite, china-clay, and brick-earth.

A railway connects Port Weld with Taiping, with an extension to the mining town of Kamunting. A line through the Kinta Valley is expected to be open next year. In 1891 the total railway receipts amounted to 91,462 dollars, against an expenditure of 61,349 dollars, yielding a dividend on the capital of 5·51 per cent. Excellent metalled carriage roads connect Teluk, Kertang, Matang, Taiping, Kamunting, and Pondok Tanjong, and a through road gives access to Taiping, Kuala, Kangsar, Salak, Ipoh, Gopeng, and Kuala Dipang. A considerable amount of work has also been done within recent years in clearing some of the rivers of obstructions.

In 1880 the total imports were valued at 2,231,047 dollars, and the exports at 1,906,952 dollars. In 1891 the imports were calculated to amount to 7,913,357 dollars, and the exports to 10,655,332 dollars.

AFRICA.

The Railways of Africa.—The following are the lengths of railways now completed :—

	Miles.		Miles.
Egypt, . . .	1068	Mauritius, . . .	66
Algeria, . . .	1883	Transvaal, . . .	62
Tunis, . . .	199	Orange State, . .	124
Senegambia, . .	268	Mozambique, . .	104
Congo, . . .	14	German East Africa, .	87
Angola, . . .	140	British East Africa, .	3
Cape Colony and Natal, .	2517	Eritrea, . . .	16
Réunion, . . .	75	Total, .	6626

—*Boll. della Soc. Fiorentina della Soc. Afr. d'Italia*, June.

The Welle : Vankerckhoven Expedition.—In the month of July 1891 the members of this expedition, of which so many reports have been current, met at Jabbir. M. Milz made an excursion northwards, reaching the residence of the Niam-niam chief Semio, on the right bank of the Mbomu (lat. 5° 30′, long. 25° 20′), while M. Ponthier ascended the Welle to the confluence of the Bomokandi, where he established a post. On Dec. 12 the expedition left the Bomokandi, a detachment toiling up the river in boats to erect a post at the old *zeriba* of Ali, while the main body marched to the south-west across the country of the Abaramba, following pretty closely the watershed between the Welle and the Bomokandi. It is a land of grassy hills, with wooded swampy valleys, inhabited by a tribe of savage cannibals. A new post was established among the A-Madi on the Welle, where the river makes a bend to the south. After a long rest here the expedition ascended the river for some distance, and then traversed the country of the Monbuttu along the watershed between the Bomokandi and the Gadda, another tributary of the Welle. The western boundary of the basin of this river marks the limit of Dr. Junker's explorations in this region, and also forms a line of demarcation in the physical aspects of the country. While to the west the country is only slightly undulating, and is watered by numerous shallow water-courses with muddy banks, to the east extends a vast grassy plain studded with gigantic rocks of the most capricious forms. The slopes

of these elevations are inhabited by Monbuttu and Momfu. All the country to the east between 29° and 31° W. long. was previously unknown. The expedition crossed it on the parallel of 3° N. lat., and regained the Welle, here called the Kibali, near Mount Gaima. At this part the river receives two important tributaries coming from the south, the Zoro and Obi. The country is inhabited by the Loggo, who cultivate maize, beans, *eleusine*, and calabashes. The Kibbi (the upper course of the Welle) was crossed about 30 miles from its source, and a post was installed at the village of Lemhin, and also at Ganda, 3° 35′ N. lat., at the source of a small affluent which joins the Nile between Dufile and Labore Khor Aju (?). Wadelai, where the expedition reached the Nile, is three days' march to the south-east of Lemhin.—*Mouvement Géogr.*, No. 17.

The Rufiji River, which enters the sea opposite the island of Mafia in latitude 8° S., was ascended in May 1892 by Lieutenant Fromm in a steam launch drawing 5 feet 9 inches of water. The entrance chosen was the Zimba Uranga mouth, and at high water the bar of Msala was crossed, which runs quite across the stream, here 270 yards broad. After the delta country with its mangroves is passed, a level, fruitful, and cultivated country is reached, through which the river flows in a bed 220 yards broad and 20 to 26 feet deep, obstructed by a bank, over which, however, at high tide there are 14½ feet of water. The navigable channel is not very broad, and is not easily recognisable among the lagoons and small islands. At Yobine Yongo the rise of the tide ceases to be perceptible. Soon after a bar is crossed with 5 feet 10 inches of water over it. A tributary, the Rubongare, is spoken of as descending from the Kekhe mountains and containing water all the year round. Further inland *Dum* palms make their appearance, the country is liable to inundation, and the native huts are raised on piles. The navigation of the Rufiji ends at the Pangani falls (37° 50′ E. lat.); thus far it can be ascended by vessels drawing not more than 2½ feet of water. The banks are exceedingly fruitful and suitable for cultivation.—*Globus*, Bd. lxiv. No. 5.

The Aldabras.—In May the Administrator of the Seychelles, the Hon. Risely Griffith, C.M.G., paid a visit to this group of coral islets, which lie to the north-west of Madagascar, in about 9° 30′ S. lat., and have an area of about 30,000 acres. They are of interest as being the home of a gigantic tortoise (*Testudo elephantina*). The largest island, Aldabra, appears to be a mass of very ancient coral, from which all the softer portions have in the course of centuries been washed out, so that the remainder is hard and ragged. Yet small trees, shrubs, and vines flourish upon it, and apparently the tortoises find ample means of subsistence, for, according to Mr. Spurs, the lessee of the islands, they are not fewer than 1000 in number. Rock oysters also are very numerous and of fine flavour. The orchilla weed grows upon the mangroves and other trees, but the supply is not large. On Cosmoledo, the nearest of the other islands, there are large numbers of goats.—*Colonies and India*, August 12th.

OCEANOGRAPHY.

Soundings between San Francisco and Honolulu.—At the end of 1891 and the beginning of 1892, the *Albatross* and afterwards the *Thetis* were engaged in investigating the configuration of the bottom of the Pacific for the purpose of laying a cable between California and the Sandwich Islands. It was found that the most favourable route would be a rhumb line from Monterey to Honolulu. The smallest length of cable would be required, and the line would pass over an even bottom and avoid submarine mountains. The distance steamed was 10,769 miles,

and 874 soundings were taken over a distance of 6785 miles. Within a very short distance of Salinas Landing, a sudden depression nearly 2000 feet deep was discovered, which gradually sinks to a depth of about 9000 feet at not more than 15 miles from the coast. Then the shelving continues more gradually down to 18,000 feet, and this depth is maintained to within a short distance of the Hawaiian Islands. At a distance of 570 miles from Monterey a mountain rises to a height of 2½ miles, or to within about 3000 feet of the surface of the ocean, and another is situated about 200 miles east of Honolulu. Their slopes are steep, and the cable route, diverging slightly, passes along their feet. Coloured charts representing in profile the undulations of the bottom of the ocean, along a great circle between Salinas Landing and Honolulu, between Concepcion Point and Hilo Bay, and along a rhumb line between Salinas Landing and Honolulu, as well as a contoured chart of the bottom, have been prepared in the Adjutant-General's Office. Washington.—*Bull. of the Am. Geogr. Soc.*, vol. xxv. No. 2.

MISCELLANEOUS.

On August 27th the laying of the cable to connect the **Azores** with Lisbon was completed.

On July 15th the Austrian vessel, the *Pola*, again set forth on a scientific expedition to the **Eastern Mediterranean**, having on board Professors Steindachner, Natterer, and Luksch.—*Petermanns Mitt.*, Bd. 39, No. 9.

Many inquiries having been made after **Mr. Joseph Thomson**, it will no doubt interest our readers to know that he is staying with Mr. Cecil Rhodes at Kimberley, where he will probably remain for the next twelve months. His health, we are glad to learn, is much improved.

Lieutenant Garde, who accompanied Captain Holm on his expedition to East Greenland in 1883-4, has explored the inland ice of **Greenland**, starting from the Sermeliarsuk glacier in lat. 61°. He traversed a distance of 180 miles in thirteen days, attaining to an elevation of 7000 feet.—*Revue de Géogr.*, Sept.

In 1892 and 1893 Mr. Ch. W. Richmond, of the U.S. National Museum, had many opportunities of confirming the existence of **sharks** in the fresh water of **Lake Nicaragua**. They are about four or five feet long on an average. In the same lake is also found another marine fish, a species of sawfish (*Pristis*), about three feet in length.—*Science*, Sept. 22nd.

It is proposed to connect **Ceylon** with India by a railway. A very long bridge would be required across Adam's Bridge, but its construction would be facilitated by the numerous reefs. The inhabitants of the northern part of the island complain of the want of railways, and demand the construction of a line 200 miles long, from Jafna to the Colombo-Kandy section.

In Volume i. p. 49 of the *S.G.M.* the question was asked by a correspondent, R. B., how the foreign-looking name **Omoa** found its way to the west of Scotland? A highly probably solution has now been sent us by Mr. H. A. Webster, who found the name mentioned in a forgotten volume of poems by Robert Alves, A.M., published in 1782. Omoa, or Omoah, is a small town on the coast of Honduras, which was garrisoned by British troops during the American War of Independence, but was evacuated in 1780. *The Scots Magazine*, p. 143, narrates how Captain Inglis, on reaching Omoa to strengthen Captain Luttrell's force, found the place occupied by 3000 Spaniards, whose commander hospitably entertained

the British captain and his officers. Now, it seems quite possible that the Scottish hamlet may have been named Omoa by some soldier or sailor who had been campaigning in Honduras, much in the same way as Portobello obtained its name. Omoa first occurs as the name of some ironworks established by Colonel William Dalrymple of Cleland in 1787 (*Statistical Account of Scotland*, vol. xv. p. 60), who may, perhaps, have been stationed in the West Indian fort.

NEW BOOKS.

Ceylon in 1893. *Describing the Progress of the Island since* 1803, *its present Agricultural and Commercial Enterprises, and its Unequalled Attractions to Visitors.* By JOHN FERGUSON. London: J. Haddon and Co.; and Colombo: A. M. and J. Ferguson, 1893. *Price 7s. 6d.*

This volume of nearly 500 pages, with over 100 illustrations and a good general map (in pocket), is a recast of *Ceylon in* 1883, which was enlarged in second and third editions in 1884 and 1887, and is, therefore, the fourth of the best succinct and popular account we have of one of the most interesting of our Crown colonies. The author's unrivalled opportunities of acquiring all sorts of information concerning whatever relates to the island, and his literary ability, have enabled him to bring together into the form of an illustrated handbook a great wealth of late and reliable information that should interest the general reader as well as the visitor and the resident. The general contents of the work—comprising a brief but valuable survey of the history, productions, government, social life, etc.—extend to 196 pages. This is followed by fifteen appendices, of a miscellaneous character, including two lectures on Ceylon and on tropical products; a paper on planter's work—in tea, cinnamon, and cinchona culture; sport and elephant *kraals*; travelling and places of interest; Christianity and missions; Buddhism in the island; census; taxation; Ceylon and its agriculture; gems and gem-digging; sketch of the career of Mr. A. M. Ferguson, the oldest newspaper editor in Asia; and other *notitiæ*; with a glossary of native words and terms—unfortunately, for convenience of reference, divided into no less than seven sections or separate alphabetical lists. Mr. Ferguson evidently loves the island—"the pearl-drop on the brow of India"—and has done his work lovingly and with the fidelity of painstaking care.

Far Cathay and Farther India. By Major-General A. RUXTON MACMAHON, formerly H.M. Political Agent at the Court of Ava. London: Hurst and Blackett, 1893. Pp. xii+340.

This is a timely and most important volume, well put together by a high and responsible ex-official who represented our Government at the Courts of the last two monarchs of Burma, and in the difficult times ending in the absorption of the kingdom.

The intercourse of the States of Farther India with India, China, and each other is lightly and clearly sketched by General MacMahon from the beginning of our era, and new light is thrown on many obscure and devious paths. The writer seems to have miscalculated the vitality of Gallic aggressiveness when he wrote that France and Siam are now friendly (p. 54). He also alludes to the valuable Shan States of Keing Tung and Keing Hong on the Upper Mekong, which Siam had long tried to seize, but which were strongly garrisoned by Burma.

General MacMahon's account of the most ancient of the trans-Indian races, the Karens, is full of interest and instruction to our young administrators. The

are a strange shy people, divided into the Sgan and Pwo and Bghai clans. There is also another wild and rather fierce clan of highlanders, the Kaya or Red Karens, mostly found on or around their sacred Olympus, the Nattoung or Hill of Spirits, to the east of Toungu (p. 231). The Karens are exceedingly superstitious and not easily christianised ; but, like all members of the Mongoloid race, they appreciate good ethical teaching, though they eschew the Christian dogmas of our creeds and liturgies (p. 209).

The same remarks, somewhat modified, may be applied to the Kakhyens, Khyens or Chins (with the latter of whom the author has no personal acquaintance), the Shans or Tai, and their Aham, or Assam, brethren, the Singpos. General MacMahon reminds us that M. Terrien de Lacouperie traces the Shans back to the 23rd century B.C. In Aham or Assam they have got lost among other Mongolian and Kolarian peoples, but in the east they have till now maintained their individuality down to Lower Mien (the name of the Chinese and Marco Polo for Burma), Laos, and Siam. Their kingdom of Pong, indeed, long ruled Upper Mien, and they still remain a strong-minded and energetic race, of marked character and ability ; but they want the power of combination which intercourse with India gave in later times to the Burmese.

On this last people the General writes very fully, touching even on their obscure genesis, as found in their sacred *Maharajah Weng*—a national history like the *Shahnameh*. The Burmese are an example of how little influence the best and highest religions really exercise over the customs and conduct of nations ; for, though the best and truest of Buddhists, to whom it is forbidden to hurt even a fly, they have often on the erection of a fort or capital buried human victims alive at its base, to propitiate the "Earth's Spirit," regardless of the fact that Gotama denied the existence of souls or spirits. General MacMahon thinks that the Government should base the education on religion, which in past times "impressed on the national life such precepts as self-denial, honesty, truthfulness, obedience to parents, tenderness to animals, and faithfulness to the marriage tie," and condemns the present purely intellectual training, which renders the Burmese "arrogant, overbearing, and indifferent to the amenities of social life" (pp. 101 and 103).

We have a little fault to find with the author's ethnology, or, it may be, only a want of clearness. He speaks of "what Aryans have succeeded in accomplishing" in Burma, as if the Bengalis, Bangas, Mongs, Talaings, etc., were Aryans (though, indeed, he afterwards asserts that only the northern part of Burma was civilised by Aryans). Mr. Hewitt has shown in articles published during the last few years in the *Journal of the Royal Asiatic Society* that Mongoloid kings, Mughs or Maghs, Kols, Kochs, Kuchis, or Kosis in North-East India, and Dravids, like the Chalu Kias, Bangas, Andhras, Tri-Lingas, and other such Sisna Devites, were the real civilisers of India and Farther India. It is they who have left the impress of their civilisation, religion, literature, and language on Far Cathay and Farther India, and it is their Ophite and Sivaite shrines which are found buried in the forests of Cambodia, Siam, Java, and Cochin-China, where sculptures still tell us of their "Varman" or Hindu Dravid Kings (*Asiatic Quarterly Review*, vol. vi. No. 11).

This excellent volume of General MacMahon's ought to have had a good map or two and a copious index.

Life with Trans-Siberian Savages. By B. Douglas Howard, M.A. London : Longmans, Green, and Co., 1893. Pp. x+209. *Price 6s.*

Much has been written of recent years concerning the Ainu of Yezo, Japan ; but Mr. Howard's experiences amongst the Ainu of Saghalin appeal to us with none

the less freshness, although it is probable that we know nearly all that can be known of the character and customs of this remnant of a savage race. Having got on very friendly terms with the governors of the Russian penal settlements in the Far East, Mr. Howard found himself an honoured guest in the most eastern of all, the island of Saghalin. Here, with the very necessary assistance of the governor, he was able to take up his abode in an Ainu village far from the touch of civilisation. The people received him as a guest, installed him as Head Wizard in recognition of his professional skill as a surgeon, and finally elected him Honorary Chief. As such he was initiated into the mysteries of the making of poison for the arrowheads, and with great difficulty saved himself from the infliction of having his ears bored and his person tattooed as marks of his Ainu adoption. The fishing and hunting expeditions in which he shared are fully described, the bear-hunt being especially thrilling. On his return to civilisation Mr. Howard determined to continue his studies among the Ainu of Yezo, but found great difficulty in getting there. He finally reached Hakodate shattered and bruised, having escaped with bare life from double shipwreck in two Japanese sailing vessels. This put an end to his active adventures. The book closes with an interesting comparison of the Ainu inhabitants of Saghalin and Yezo, the chief conclusion being their absolute identity in physique and customs and, apparently at least, to a large extent in language. Drunkenness, the besetting vice of the Ainu of Yezo, is unknown in Saghalin, a fact which the writer lays to the credit of the Russian Government. The sale of intoxicants is absolutely prohibited in the island. Mr. Howard is evidently a man of broad sympathies ; and simply and modestly he tells the tale of how he won the affections of a rude race of grown children.

La République du Paraguay. Par Ernest van Bruyssel. Bruxelles : Librairie Européenne, C. Muquardt, 1893. Pp. 219.

The author tells us in his preface that he obtained in Paraguay itself the information which he has put together in this work. This circumstance makes his statements all the more authoritative, and in perusing his pages we have found no reason to distrust his accuracy. The style in which he writes is easy, perspicuous, and unaffected, while his treatment of his subject is at once concise and comprehensive. His first three chapters are occupied with a review of the history of Paraguay from its discovery by the Spaniards, early in the sixteenth century, down to the present day. It is a history which presents not a few features of striking and peculiar interest, among which stands out pre-eminent the success achieved by the Jesuit missionaries (sent out in 1608 from Spain) in converting the natives and establishing them in those industrial colonies which, under the name of "Réductions," have acquired a world-wide celebrity. The most interesting part of the work, indeed, is that which describes how these theocratic settlements were organised, conducted, and governed, how rapidly they multiplied, and how their decay and ruin came to be effected. The historical chapters are followed by others in which the country is exhaustively described. The reader's attention is then directed successively to the population, to the means of communication, to the different industries pursued, to the commercial relations of the country, and its position financially. In the concluding chapter the author communicates his views on a subject of great practical importance—that of emigration. It may be safely said that there is no country in the world which seems to offer, to the intending emigrant, such a combination of advantages as Paraguay. Its climate is salubrious, its soil remarkably fertile, its population sparse, its natural products almost beyond example abundant, varied, and valuable, while its government affords a full measure of freedom not only to all classes of its subjects but also to alien settlers. The

work will be very useful to such persons as intend to settle in the country, especially as an appendix treats of sundry matters for their special information. The work should have been accompanied with a map.

Ergebnisse der in dem Atlantischen Ocean von Mitte Juli bis Anfang November 1889 ausgeführten Plankton-Expedition der Humboldt-Stiftung. Band I., A. Reisebeschreibung; und C, Geophysikalische Beobachtungen. Von Dr. Otto Krümmel. Kiel und Leipzig: Verlag von Lipsius und Tischler, 1892.

The first part of the first volume sets forth the narrative of the voyage of the ship *National*, chartered by the Humboldt-Stiftung for the investigation of the distribution of Plankton in the Atlantic Ocean. The course extended from Kiel through the Pentland Firth to the neighbourhood of Cape Farewell, thence across the Banks of Newfoundland to the Bermudas, eastwards to the Cape Verd Islands and Ascension, westwards to Para, and finally from Para to the Lizard, *viâ* the Azores. Detailed reports on the results of the almost daily tow-nettings are promised in subsequent volumes, and the narrative derives its interest chiefly from accounts of the various stopping-places—especially of Para, where a fortnight had to be spent for repairs to the ship's propeller—and from the survey of the Sargasso Sea, which was crossed on the way to the Cape Verd Islands.

Section C contains the results of physical and meteorological observations made during the cruise; and although work in this direction was necessarily very limited, the discussion of the data in their relation to previous researches is of extreme interest. Three papers are strictly meteorological. The first refers to factors for converting estimates of wind force by Beaufort scale into velocities (mètres per second). Thirty-eight sets of comparisons were made on board the *National*, and, averaging the results with those of Chatterton, Waldo, Köppen, Meyer, Mohn, and the *Gazelle*, Dr. Krümmel obtains the following velocities for forces 2 to 8 :—

Wind force, . . .	2	3	4	5	6	7	8
Velocity (*mèt. per sec.*), .	3·4	5·1	7·1	9·4	11·7	14·2	16·2
„ (*miles per hour*),	7·6	11·4	15·9	21·0	26·2	31·8	36·2

The next paper deals with observations of the upper clouds, and the third with weather in the horse latitudes, and the connection of sea breezes with the flood-tide. Dr. Krümmel found that the sea breeze becomes specially strong at Para immediately after the setting-in of the flood—a phenomenon observed at Cadiz, Camaroons, and elsewhere, and possibly finding expression in the old Scotch proverb, "Never trust the second flood."

Six fresh soundings are recorded, one of special interest east of Bermuda, but in most cases deep-sea temperatures were observed with a thermometer attached above a dredge-net; the depths are accordingly somewhat uncertain, and the total number of observations is not large. Seventeen samples were collected at various depths by means of a Sigsbee cup, and of these the densities and chlorines were determined, the former by hydrometers and the latter by the usual volumetric method. Dr. Krümmel discusses at some length the vexed questions of calculation of salinity from chlorine and density determinations, concerning which a good deal of recent work has not yet found its way into English. The chlorine co-efficient, (κ) by which the number of grammes of (total halogen calculated as) chlorine in 1 kilogramme of sea-water (χ) must be multiplied in order to give the salinity or total salts in 1000 parts by weight of sea-water, was stated by Forchhammer to have a constant value 1·811. Tornöe gave the value 1·809, Dittmar 1·8044, Jacobsen 1·8094, and Ekman 1·811. On revising Ekman's determinations, Pettersson was led to doubt the constancy of the value of κ, and on further investigation found that it

increased considerably with fresher water. Dr. Krümmel discusses all the available data, and gives for salinity p the expression

$$p = 1{\cdot}83\chi - 0{\cdot}0011\chi^2$$

Dealing next with the calculation of density from chlorine determinations, Dr. Krümmel gives the formula

$$_{17{\cdot}5}S_{17{\cdot}5} = 1 + 0{\cdot}00139\chi - 0{\cdot}0000019\chi^2$$

where $_{17{\cdot}5}S_{17{\cdot}5}$ has the usual meaning, and χ indicates the total halogen in 1 litre, not 1 kilogramme. Combining the two, the relation between density and salinity becomes

$$p = 1312\ (S - 1)$$

The co-efficient 1312 has a probable error $\pm 4{\cdot}9$, and does not seriously differ from Karsten's accepted value, 1310.

The remainder of the book is occupied with an account of experiments, encouragingly successful, made with the view of determining the density of sea-water from its refractive index, and observations on colour and transparency. Two charts show the distribution of salinity at the surface of the North Atlantic and the prevailing colours in terms of Forel's scale. The narrative is illustrated by a number of engravings and some excellent photogravures. Errors occur, on the whole, rarely, but in a work of this kind one hardly expects repeated references to "Lord Abercromby," or the statement that Lewis is "die nördlichste der Shetland-Inseln."

Short Stalks: or, Hunting Camps North, South, East, and West. By Edward North Buxton. With numerous Illustrations. Second Edition. London: Edward Stanford, 1893. Pp. xiii + 405. *Price* 21*s.*

In ancient days the hunter must have been one of the first to tell a story, and it is interesting to observe how often the art of the *raconteur* still goes with that of the sportsman. Of this combination Mr. Buxton is a good illustration. For that he is a sportsman of the nobler sort the anxiously conservative naturalist and the tender-hearted may be assured by the declaration that in all his short stalks (spread over a quarter of a century) the author shot only about four-score noble creatures, while the details of every chapter strengthen our conviction that the well-being of any species of game might be safely left in his hands. We do not, of course, refer to the frequent misses which he frankly and humorously confesses, but to his love and respect for the creature. Indeed, the common accusation which proclaims the sportsman as an exterminator is for the most part unjust: it is the mercantile spirit, not the sportsman's, which kills. Mr. Buxton tells us first of the mouflon, that small edition of the North American big-horn, which hides in the broken mountainous parts of Corsica and Sardinia among the "bruyère" heather, and of which the Sards have a fable relating that a hair which fell from the head of a hunter was *smelt* by the wild boar, *heard* by the stag, and *seen* by the mouflon. Then he describes (without the usual sensationalism) the chase of the chamois, which is, perhaps, the finest of all forms of sport. From the Alps Mr. Buxton takes us to the Rockies, where he lured a fine wapiti with a penny whistle, followed the wolverine (who is said to half-cock the spring-guns before he steals the bait), and was finally best rewarded by securing some splendid big-horns. Other quests led the author to the outliers of the Atlas Mountains, where he got a few heads of Barbary sheep; to the spruce and birch forests of Scandinavia, where he sought and found the biggest of big game in the northern hemisphere—the elk; to the Taurus after 'the wary father of all the goats;' to the Pyrenees for the rare ibex of that region; and so forth on yet other short stalks.

In the preface the author modestly says that any charm his book may possess is due to the art of the wood-engraver ; but while most of the illustrations are very good, we cannot allow them to be thus complimented at the expense of the text. For the book is full of picturesque description and of vividly recounted incident ; and the terse, witty way in which the author hits off the peculiarities of the various animals which he stalked is both valuable and delightful.

Gun and Camera in Southern Africa: A Year of Wanderings in Bechuanaland, the Kalahari Desert, and the Lake River Country, Ngamiland. With Notes on Colonisation, Natives, Natural History, and Sport. By H. Anderson Bryden, Author of *Kloof and Karoo in Cape Colony.* 8vo. London : Edward Stanford, 1893. Pp. 544. With numerous Illustrations and a Map. *Price* 15*s.*

This book gives an interesting account of animal and human life in Bechuanaland, the Kalahari, and Ngamiland. The naturalist and the sportsman will find much to enjoy—for instance, in the chapters on the giraffe and the hunting of it—but they will also be saddened by the detailed evidence as to the terrible thinning of all the big game. The quagga has already gone ; the great white rhinoceros is on the verge of extinction ; elephant and giraffe will soon be but memories. Mr. Bryden's lament over this waste of animal life is repeated in various chapters, and has the painful effect of a reiterated dirge. He is himself somewhat conscience-stricken in regard to the giraffe, and vows not to shoot another unless for necessary food. Those who are more interested in the troublous human life of Southern Africa will also find food for meditation in this volume ; for instance, in the charming sketch of Khama, chief of the Bamangwato. On problems immediately pressing the author casts some vivid flashes of light. To the colonist and settler the book should also be useful, for it abounds in information about practical affairs ; see, for instance, the chapter on "Waggon Life and Camp Requisites." And even if one is neither naturalist nor sportsman, neither politician nor colonist, one will enjoy Mr. Bryden's volume, for he writes briskly and with a pleasant humour of his year's wanderings. Many of the author's photographs were made in unpropitious circumstances, as the results sometimes suggest ; but on the whole the illustrations serve their purpose well, and some—*e.g.* that on page 38—are very beautiful.

With Captain Stairs to Katanga. By J. A. Moloney, Medical Officer of the Expedition. London : Sampson Low and Co., 1893. Illustrations and Map. Pp. 277. *Price* 8*s.* 6*d.*

This book is an account written from the author's diary of Captain Stairs' expedition under Belgian auspices to Katanga. The Katanga Company had obtained from the Congo Free State certain preferential rights over the mines reputed to be situated in the countries of Katanga and Urua, and a third of the trerritory belonging to the public domain within those limits. The expedition was practically a race against time, as it was suspected that the British South Africa Company were trying to annex Msiri's kingdom. The usual ups and downs of African travel are vividly described, and the author gives some interesting notes upon the various tribes with whom he came in contact. Dr. Moloney does not believe in a mixed staff acting under an international syndicate. He says : "On the whole, I am inclined to pronounce that such enterprises are less likely to succeed than those conducted on more homogeneous lines. Political considerations naturally cause a Company thus constituted to adopt a somewhat flabby and vacillating policy. Still more certain is it that differences of race are accentuated by the

worries and fatigue of a long march overland, and that the small band splits into yet smaller cliques Britons on the one side and Continentals on the other. The world, however, has grown rather tired of the quarrels and jealousies that are the inevitable concomitants of hazardous endeavours. Accordingly, I do not propose to return again to this unpleasant topic; still, the existence of some unnecessary friction in Stairs' expedition cannot be wholly ignored." It seems that Captain Stairs, as well as the author, had no belief in a railway from the coast to Tanganyika, thinking that it would never return a dividend; nor does the author approve of Teutonic administration. He says: "Two fundamental ideas seem to be entertained by such officials as we encountered: the first that ivory was the be-all and end-all of the occupation; and the second that the niggers are best treated as a conquered race, subject as such to a war indemnity in the shape of forced contributions." A detailed account is given of Msiri's career, his dealings with the white men, and his general behaviour, as also of his death; he was shot by Captain Bodson, who was likewise killed.

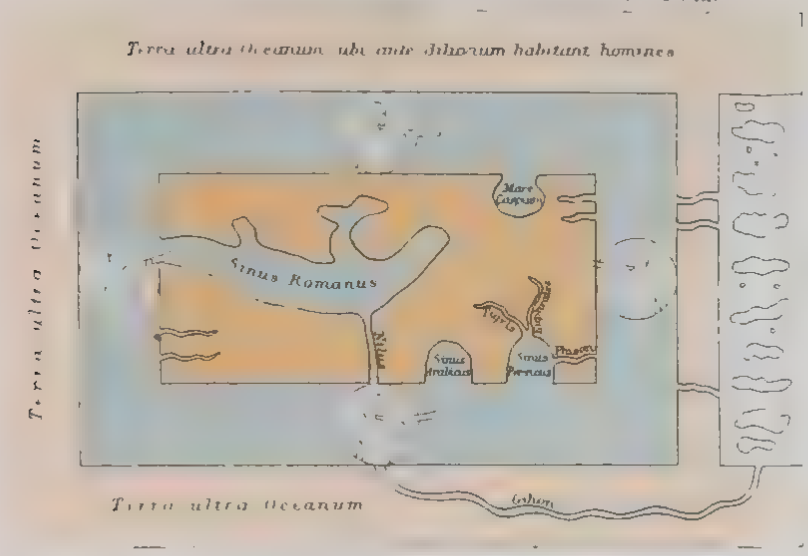
Portraits of members of the expedition are given, and a route map serves to illustrate the volume.

The Autobiography of an Old Passport: Chiefly relating how we accomplished many Driving Tours with our own English Horses over the Roads of Western Europe, before the time of Railways. By Rev. Alfred C. Smith. London: Digby, Long, and Co., 1893. Pp 586.

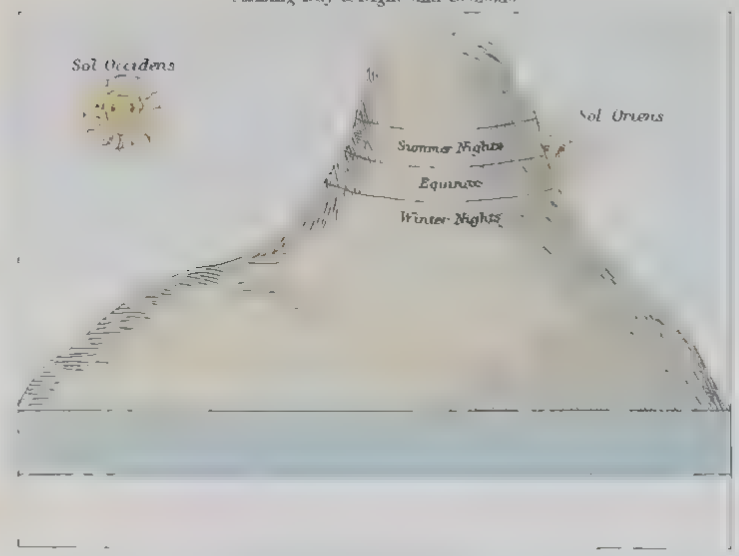
A relic of pre-railway days, when English travellers in Europe required to have long purses, as they had to drive by road from town to town, this large volume of reminiscences possesses much interest. We see in it the Europe which our forefathers saw described with much spirit and minuteness by Mr. Smith. We note how often customs have changed, and we have a glimpse of fashions in dress, for there are numerous illustrations of men and women in the book. There is no doubt that in pre-railway days communities lived a life apart, uninfluenced by fashions from without, and that travellers then discovered much more that was novel and curious than they do now. Take this picture of the passage of the Pope through Rome in 1841, a sight never now witnessed:—"As we wandered day after day about Rome, we occasionally met the Pope. His approach was always heralded by a mounted dragoon a long way in advance, then at some interval by another, and again shortly after by a third, then six or eight others in closer order; and then came the Pope's large, clumsy coach, drawn by four big, heavy horses, closely followed by another carriage, also drawn by four horses, in which two or more cardinals sat. Some twenty dragoons followed immediately behind. As the Pope drew near, it was the custom for everybody in the street to fall on his or her knees, and so remain until his Holiness had passed by. This was somewhat inconvenient when the streets were muddy after a shower, as was sometimes the case; but we never saw the slightest hesitation on that account—down they all went in the mud, without any exception, and we do not suppose it ever occurred to any of them that it was possible to omit this ceremony of respect."

Mr. Smith and family passed through France during 1851, and on reaching Brignolles, shortly after Napoleon's *coup d'état*, found that town in the hands of a Republican mob. Our travellers "were surrounded by a dense crowd shouting the *Marseillaise*, and were ordered to follow three men in blouses, armed with bayonets, who marched abreast in front of our horses, while others similarly armed brought up the rear, and others marched at the side. The party was duly tried and acquitted of treasonable practices, and after a short imprisonment was furnished

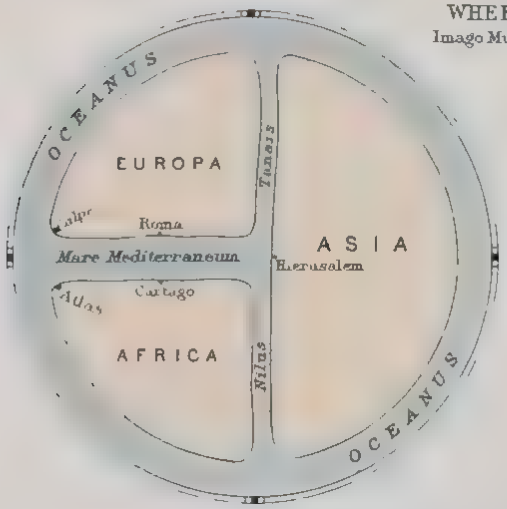
WORLD MAP OF COSMAS INDICOPLEUSTES - VI Cent



THE MOUNTAIN OF COSMAS INDICOPLEUSTES
Causing Day & Night and Seasons



WHEEL MAP
Imago Mundi XI Cent



THE WORLD
according to
HOMER
BC 1000

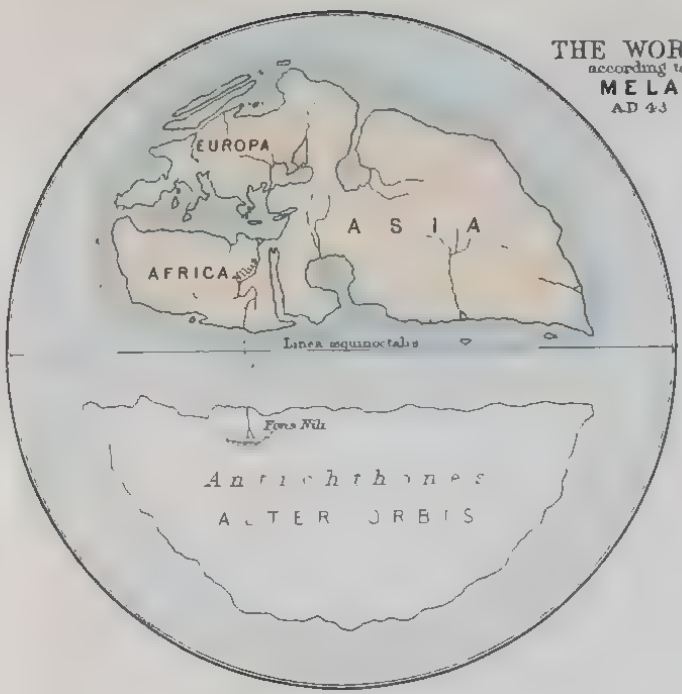
THE WORLD
according to
HECATÆUS
BC 500

THE WORLD
according to
HERODOTUS
BC 450
EUROPA
Sigynnæ
Scythia
Issedones
Massagetæ
Celtæ
Ligyes
Iberes
Cynetes
Cynesii
Sardo
M. Haemus
Thracia
Pontus Euxinus
Palus Mæotis
M. Caucasus
Mare Caspium
Colchis
Phrygia
Sogdi
Bactri
Parthi
Armenia
Media
Assyria
Persis
India
Indus
Carthago
Tartessus
Gades
Columnæ Herculis
Mauri
Atlantes
Garamantes
Lotophagi
Cyrene
Memphis
Babylon
Susa
Persepolis
LIBYA
Æthiopes
Arabia
Sinus Arabicus
Nilus
OCEANUS ÆTHIOPICUS
MARE AUSTRALE
MARE ERYTHRÆUM

THE WORLD
according to
DICÆARCHUS
BC 300
MARE ATLANTICUM
Thule
EUROPA
Palus Mæotis
M. Caucasus
Mare Caspium
Iaxartes
Oxus
Pontus Euxinus
M. Haemus
M. Taurus
ASIA
Rhodus
Tyrus
Carthago
Euphrates
Tigris
Babylon
Susa
Persis
Indus
Ganges
Memphis
Thebæ
Arabia
India
LIBYA
Nilus
Sinus Arabicus
Taprobane
MARE ERYTHRÆUM

J G Bartholomew

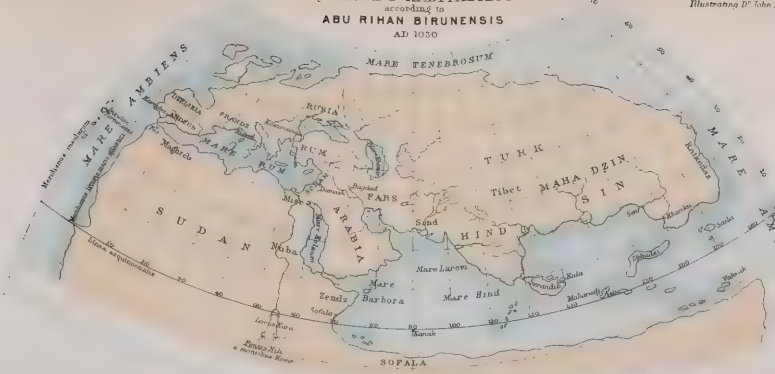
THE WORLD
according to
STRABO
AD 18
EUROPA
ASIA
LIBYA
Linea æquinoctialis


THE WORLD
according to
MELA
AD 43
EUROPA
ASIA
AFRICA
Linea æquinoctialis
Fons Nili
Antichthones
ALTER ORBIS

THE WORLD
according to
PTOLEMY
AD 150
Terra incognita
SCYTHIA extra Imaum
Issedones
Mons Imaus
SCYTHIA intra Imaum
Sarmatia
Mare Caspium
Sogdiana
Margiana
Bactriana
Hyrcania
Parthia
Media
Babylonia
Susa
Persepolis
PERSIS
Sinus Persicus
Carmania
Gedrosia
Arabia Felix
Sabæi
Adulitæ
Palæpersæ
Troglodytæ
Barygaza
Ozene
Paralis
Taprobane
Sinus Gangeticus
Chersonesus Aurea
Perimula
Thinæ
Cattigara
Sinus Magnus
Palibothræ
Ganges
INDIA intra Gangem
INDIA extra Gangem
Gangaridæ
Prasiaca
Ptolemæi Regio
Agisymba Regio
Terra incognita
Lunæ Montes
Nili Paludes
Nilus
Nili Fontes
Nili Ostia
Delta Ægypti
Ægyptus
Libya Inferior
Libya Interior
Africa
Cyrene
Alexandria
Syrtis Major
Syrtis Minor
Garamantes
Nigritæ
Æthiopia Interior
Æthiopia
Meroe
Ptolemais Theron
Adulis
Ptolemæus Epidires
Ptolemæus Hydreumus
Ptolemæus Philometor
Ptolemæus Evergetes
Ptolemæus Philadelphus
Ptolemæus Lagi
Berenice
Myos Hormos
Coptos
Thebæ
Memphis
Arsinoe
Pelusium
Phœnice
Damascus
Judæa
Jerusalem
Samaria
Galilæa
Ituræa
Trachonitis
Batanæa
Auranitis
Abilene
Chalcis
Cœle Syria
Seleucia
Antiochia
Cilicia
Cyprus
Rhodus
Creta
Mare Erythræum
Linea æquinoctialis
OCEANUS INDICUS
Sinus Barbaricus
Promontorium Prasum
Promontorium Diarrhodus
Promontorium Notu
Promontorium Aromatum
Insula Menuthias
Insula Taprobane
Insula Diosceridis
Insula Agathodæmonis
Insula Iabadiu
Insula Cattigara
Insula Sindæ
Insula Sarapidis
Insula Solis
Insula Cassiteridum
Insula Britannia
Insula Hibernia
Insula Thule
Oceanus Germanicus
GALLIA
GERMANIA
HISPANIA
ITALIA
Roma
Corsica
Sardinia
Sicilia
Gades
Mauretania
Carthago
Mare Internum
OCEANUS OCCIDENTALIS
Europa
Asia
Africa
Libya

PLATE V
Illustrating Dr John Murray's Paper

QUADRANS HABITABILIS
according to
ABU RIHAN BIRUNENSIS
AD 1030


MARE TENEBROSUM
MARE AMBIENS
MARE ERYTHRAEUM
MARE AMBIENS
RUBRUM
Mare Rubrum
Mare Persicum
Mare Arabicum
Mare Barbora
Mare Larem
Mare Hind
TURK
MAHADZIN
SIN
Tibet
FARS
Sind
HIND
ARABIA
SUDAN
Nubia
Zeada
Barbora
Zanguebar
Mozambique
Sofala
Insula Zanzibar
Insula Comaro
Insula Madagascar
Insula Mauritii
Insula Rodriguez
Insula Reunion
Insula Diego Rodriguez
Insula Mascarenhas
Insula Rodrigo de Lima
Insula Sancti Laurentii
Insula Sancti Mauritii
Insula Sancti Brandani
Insula Sancti Thomae
Insula Sancti Helenae
Insula Ascensionis
Insula Sancti Matthaei
Insula Sancti Joannis
Insula Sancti Georgii
Insula Sancti Mariae
Insula Sancti Antonii
Insula Sancti Jacobi
Insula Sancti Philippi
Insula Sancti Andreae
Insula Sancti Petri

140
80
60
40
20
0
20
40
60
140
Okh
Yokohan
Carol
AUSTR
Sydr
Meibc
Royal

KNOWLEDGE OF GENERAL EXPLORATION* OF WORLD ACCORDING TO MAPS OF GEOGRAPHERS AT DIFFERENT PERIODS.

* *Exploration here implies nothing more than definite knowledge of the existence of certain lands and seas included in maps*

with a dirty scrap of paper on which was scrawled, "Laissez passer le citoyen Alfrith Chemed et Sa famille allant en angleterre." They then made their way to England as fast as possible.

Mr. Smith's driving tours extended from 1839 to 1861, and this volume furnishes much curious information regarding the sights then witnessed by travellers in Germany, Switzerland, Belgium, Holland, France, Italy, Norway, Sweden, Denmark, Spain, and Morocco.

Round the Black Man's Garden. By Zélie Colville, F.R.G.S. With Illustrations from Drawings by the Author and from Photographs, and a Map of Central Madagascar. Pp. xii+344. Edinburgh and London: William Blackwood and Sons, 1893. *Price* 16*s.*

This book is distinctly above ordinary narratives of the same class. Mrs. Colville has travelled all round Africa, crossed Madagascar, visited the Orange Free State and Cape Colony, and has written a very sprightly and charming account of her experiences, well illustrated from drawings and photographs. We are not treated to lengthy moralisings or to recondite political disquisitions, but the story runs pleasantly along, enlivened by bright incident and interesting descriptions. The authoress has good powers of observation, and knows how to relate what she sees crisply and without verbosity. The book will doubtless find many readers who will accompany Mrs. Colville with much pleasure upon her long journey, and will come to the end of it with regret.

Schetsen uit Insulinde. Door E. Nijland. Utrecht: C. H. E. Breijer, 1893. Pp. vii+411.

The concluding pages of this work contain notes on the Moluccas and the Sunda islands, as well as a chapter on Dutch Guiana, though this colony lies beyond the scope of the book as indicated in the title. There is much less geographical information than in the earlier parts, reviewed on page 332, and the index is less complete than a student of geography would desire. It seems to have been compiled rather hastily, and hence the choice of entries has not been sufficiently considered; perhaps the most singular entry is "*Mocijlijkheden.*" As a whole, however, the work is a useful compendium, especially of native customs and industries.

Eastward to the Land of the Morning. By M. M. Shoemaker. Cincinnati: Robert Clarke and Co., 1893. 241 pp.

The American tourist has met with some truly wonderful experiences during his travels round the world, and has drawn some surprising conclusions therefrom. The portion of his book which relates to India consists largely of a mixture of religious sentiments, abuse of the natives, abuse of the British Government for its treatment of them, mingled with praise for the numerous blessings it has conferred upon them, and contains a pious wish that Russia may "get them," "because she would make short work of the whole dirty lot." The reader who knows the East detects some glaring absurdity on almost every page.

"Clear Round!" or, Seeds of Story from other Countries. Being a Chronicle of Links and Rivets in this World's Girdle. By E. A. Gordon. With Illustrations. London: Sampson Low, Marston, and Co., 1893. Pp. 442.

Presumably intended for children, this record of travel is written in a simple style, sometimes degenerating into colloquialism resulting in such statements as that, in Japan, "fires and earthquakes are of almost daily occurrence, as the houses are built in a fragile, temporary manner" (p. 201). And what, we

wonder, is "the *filling* of a bagpipe" (p. 202)! "Post-office vans *locomoting* through the land of Goshen" (p. 388) is, again, a phrase one does not expect to find in a book published in England. But, upon the whole, the volume is full of useful matter, pleasantly, and frequently very spiritedly, conveyed, regarding the experiences undergone and impressions picked up by the authoress in North America, Japan, China, India, and Egypt. Numerous footnotes convey a wealth of out-of-the-way and curious information, and are, generally, very much to the point. Perhaps too much space has been devoted to missions and missionaries, considering that the work is primarily a book of travels; but the subject will doubtless interest many, and it must be confessed that the remarks made on this head are exceedingly catholic in their spirit. The volume has, as will be seen, its faults, but it is of general interest, and ought to find numerous readers. There are several illustrations, a map of the Canadian-Pacific Railway, and an excellent index.

La République de Colombie. Par RICARDO NUÑEZ et HENRY JALHAY. Bruxelles: Imprimerie Désiré Stevelinck, 1893. Pp. 259.

The Consuls of Colombia in Brussels have compiled a very useful work on this little-known country. A sketch is given of its geography and history, and its commerce, industries, natural products, etc., are dealt with in detail. With a rich country and a population of three millions (1871), half of whom are of European descent, Colombia should have made greater progress. The capital so much needed to develop the resources of a new country is soon saved or borrowed by an energetic people, and that it is still wanting in Colombia is probably due in great measure to the enervating effect of the high temperature that prevails, especially in the low and fertile valleys. Of late years progress has been more rapid. As is shown by the statistics of imports and exports, Great Britain has considerable interests in Colombia, taking 48 per cent. of the exports and having money invested in railways and mining companies.

A useful map is appended to the volume, on which should have been shown the claims of Ecuador on the south and Venezuela on the east. We should, also, have expected these claims to have been discussed—of course from a Colombian point of view—in the text.

Jahrbücher der k.k. Central-Anstalt für Meteorologie und Erdmagnetismus. Officielle Publication. Jahrgang 1891. Wien: in Commission bei Wilhelm Braumüller, 1893.

A large collection of meteorological records are collected in these pages under the editorship of Dr. Julius Hann. The tables are accompanied by all the data required by the meteorologist—the hours of observation, height of rain-gauge above the ground, the correction of the barometer for altitude, etc.—and a list of stations is prefixed, with their latitudes, longitudes, and altitudes.

Our attention having been lately called to the question of sunshine by Mr. Dickson's excellent paper in the August number, it is interesting to notice that some of his more general conclusions seem to hold good in Austrian territory. The number of stations at which sunshine records have been kept is only ten. As far as they go, however, the observations seem to indicate that in Austria also the sunniest districts are those near the coast, the amount of sunshine recorded at Lussinpiccolo, Buccari, and Görtz being 57, 46, and 54 per cent. respectively of the total possible, whereas only 40 per cent. was recorded at Vienna and 32 at Prerau

in Moravia. Cloudiness at high elevations is but faintly indicated by 37 per cent. on the Sonnblick (10,154 feet) and 36 on the Obir (6696 feet); at Klagenfurt, about 12 miles distant from the latter, the amount is 42 per cent. Condensation of the moisture rising from below is probably the cause of the minimum, particularly low on the Sonnblick, recorded at these high stations in May. On the whole the distribution through the months is more even than in the British Isles.

Mountaineering. By Claude Wilson, M.D. With Illustrations. London: George Bell and Sons, 1893. *Price* 2*s.*

This is an excellent and trustworthy guide to mountaineering. The amount of information condensed into less than 200 pages is wonderful, and will be appreciated by any one desirous of learning all about the subject with the smallest amount of reading. No one who knows anything of mountaineering can read this book without feeling instinctively that it is written by a "practised hand" and one who has "done it all." The book is of a convenient size for the pocket; we can cordially recommend it to all would-be climbers.

Early History of New Zealand. From Earliest Times to 1840, by R. A. A. Sherrin. From 1840 to 1845, by J. H. Wallace. Edited by Thomson W. Leys. With Illustrations. (Brett's Historical Series.) Auckland, N.Z.: H. Brett. London: Truslove and Hanson. Pp. 728 + xlii. *Price* £2, 5*s. net.*

Early New Zealand is not fruitful in matters of great moment for the serious historical student. The required play of forces is absent: relative barbarism, relative civilisation—therein consists in briefest summary the record which is presented in this large volume. The authors write more at length of Tasman and Cook, investigating things before them, and weighing what they did; of the Rev. Samuel Marsden, his Church mission, and the rapid conversion of the natives to Christianity; of the colonist following the missionary; of the assembly at the Bay of Islands and the Treaty of Waitangi; thereafter (New Zealand—aboriginal and colonial—recognising the authority of the colonists' Queen) of native interests and colonial, questions commercial and material, movements social and political.

A broad philosophic treatment would hardly be appropriate for the early history of New Zealand. But there is abundance of picturesque incident, and of the wealth of material of this sort the authors have ably availed themselves. And the book—of an order rare in this country—is a good one of its kind: it is accurate and scientific in its way, while being popular and entertaining. Illustrations are profuse, but sources of information are also carefully utilised. The work may fairly be admitted to be what its authors wish it to be—a comprehensive history of the period to which it relates. Mainly, and by design, the book is a chronicle; and comment, when offered, is very seldom venturesome. Even this cautious reference to the cardinal treaty of 1840 risks more than is usual: "The Treaty of Waitangi has formed the foundation of all laws dealing with the aboriginal inhabitants of New Zealand, and is still regarded by them as their Magna Charta. The wisdom of the Act which recognised the native title to the freehold of all the land in the country, only a very small area of which had ever been cultivated or otherwise beneficially occupied, has often been questioned; but there can be no doubt that, without this concession, colonisation could never have proceeded, unless supported by a large military force, and preceded by destructive wars. The Maoris were always tenacious of their rights as owners of the soil, and it was doubtless cheaper, as well as more humane, to acquire their lands by purchase than obtain them by conquest, although the latter would have been in strict accordance with Maori usage."

An Introduction to Modern Geology. By R. D. Roberts, M.A. (Camb.), D.Sc. (Lond.). "University Extension Manuals." London: John Murray, 1893. Pp. xxiii + 270. *Price* 5*s.*

Dr. R. D. Roberts is so well known, in England especially, as an organiser of University Extension Lecture Courses, as well as a lecturer on his own special subject, Geology, that students will naturally expect from his pen a volume much above the average level of the ordinary text-books on the subject, and will certainly expect to find his treatise up to date. It is very disappointing to find that neither of these expectations has been fully realised. The book is undoubtedly good, in the main: well got up, as Murray's books all are; clearly and logically arranged well illustrated; and, further, is embellished with some beautiful little maps. But the author has made the mistake of committing himself in several places to definite expressions of opinion upon several points upon which authorities in general are by no means agreed—points to which reference might have been altogether omitted without detracting from the value of the book to any appreciable extent.

Amongst these may be noticed the reference to the theory of "Fissure-Eruptions," which are invoked by some authors to account for the wide extension of certain volcanic rocks. It is certain that many geologists of undoubted eminence as vulcanologists have refused to accept this view, on the ground that volcanic deposits of precisely the same nature and extent can be shown to emanate from true volcanoes at the present day: in Hawaii, for example. Then, again, the type of intrusive mass known as a "laccolite" is so exceptionally rare that the student should not have been led to regard the term as synonymous with intrusive sheet or boss. There does not appear to be any clearly-made-out case in the British Islands in which a mass of molten rock has been thrust into strata in such a manner as to cause any *uplift* of the rocks immediately above, which is what must happen in a true laccolite. While on the subject of intrusive masses, one might ask whether it is correct to speak of any *intrusive* mass as a *lava* (p. 208)?

Students of Scottish geology will not altogether approve of the scanty and erroneous references to the geology of their own part of the kingdom. In a book on "Modern Geology" something at least ought to have been said about the grand geological features of the north-west of Scotland, the great overthrusts and the light the phenomena accompanying them have thrown upon many problems relating to dynamo-metamorphism. Little is said about the Torridonians and their presumed equivalents, the Longmyndians. The wonderfully rich fauna of the Durness Series, again, ought surely to have been referred to, if only in connection with the discovery of *Olenellus* therein. Scottish radiolarian oozes and other deep oceanic deposits of older Palæozoic age might have received at least some notice. And the author might have made at least some mention of the important fact that between the true Lower Old Red Series of the Pentlands and Lanarkshire and the Upper Old Red Sandstone there intervenes in Scotland a thickness of between 16,000 and 20,000 feet of rocks of intermediate age, which are separated from both by unconformities second to hardly any in the whole geological series. Geologists are by no means agreed amongst themselves regarding the existence at the present day of land features dating back to times remote in the past. The evidence relating to the English Lake District points, many think, to quite a different conclusion. The same remark applies to many other areas.

The author treats the Yoredale rocks as if they consisted exclusively of deposits mechanically derived: a large proportion of them consists of limestone, and the Carboniferous limestones of Scotland have now been known for some time to be of Yoredale age.

In a popular handbook one can hardly look for statements regarding details of

minor importance; but surely these larger features in the geology of Britain should have received a notice of some kind; and it is to be hoped that when a new edition is called for, Dr. Roberts will increase the value of his book by making his geology still more modern.

Die Geographische Verbreitung der Tiere. Von E. L. Trouessart. Aus dem französischen übersetzt von W. Marshall. Leipzig: J. J. Weber, 1893. Pp. 370. 2 Maps. *Price* 4 *M.*

This is a clear and compact account of the geographical distribution of animals, which appeared a year or two ago in French, and has now been translated into German by Dr. W. Marshall. In the French edition there were illustrations, but their absence here cannot be much regretted, and the whole book looks neater in its German dress. It is a conveniently short and cheap manual, without originality and without vice, clear and to the point throughout. The author accepts the six great regions established by Wallace and Sclater, and adds two others—an Arctic and an Antarctic. He has devised a neat diagrammatic method of expressing the distribution of animals in these areas.

Bibliographie Nationale Suisse. Publié par le Bureau Topographique Fédéral; rédigé par le Prof. Dr. J. H. Graf. Fascicule II.c: *Plans de Villes et de Lieux Habités, Reliefs et Panoramas.* Berne: K. J. Wyss, 1893. Pp. xiii + 331-490.

This present part is in continuation and completion of a first part noticed in vol. viii. p. 506, and calls for no special remark beyond the observation that one is surprised, and yet on reflection not astonished, to find there exists such a voluminous collection of Swiss panoramas.

The Statistical Year-Book of Canada for 1892. Issued by the Department of Agriculture. Ottawa: Government Printing Bureau, 1893. Pp. 557. Two Appendices and Index.

We have previously had occasion to favourably notice this *Year-Book*. It has been very carefully edited, is well up to date, and contains the usual amount of miscellaneous and useful information. Canada would appear to be progressing favourably.

A Handbook for Travellers in Switzerland. Part I.: Switzerland without the Pennine Alps. Part II.: The Alps of Savoy and Piedmont, the Italian Lakes, and part of Dauphiné. Eighteenth Edition. With Maps, Plans of Towns, etc., including Additional Information for 1893, and some New Maps engraved expressly on a large scale. London: John Murray, 1892. Pp. viii + 8 + 703 + xlv. *Price* 10*s.*

The principal feature of this new edition of Murray's well-known *Handbook to Switzerland* is the insertion of half-a-dozen new maps, bearing the imprint J. Bartholomew, Edinburgh, of the principal tourist districts, drawn on a large scale and beautifully engraved and coloured (browns) in such a manner as to show contour lines at every 200 metres (656 feet). These will be an unquestionable boon to tourists of every class. The editor, that excellent authority the Rev. W. A. Coolidge, states that "every line of the text has been very carefully revised and corrected" for this edition; and though the revision seems to have been completed in 1891, there are a couple of pages in the beginning of each part conveying supplementary information of divers kinds down to the present year; besides this, each part is concluded by a new index and directory (1893), in which the information regarding hotels must be sought for.

Illustrated Europe. Nos. 136-138, *Nervi and its Environs.* By Dr. Arnold Schetelig. With Seventeen Illustrations by C. Fayod. Pp. 76 *Price* 1*s.* 6*d.*

Nos. 151, 152, *Spiez and the Kanderthal, in the Bernese Oberland.* By Pastor Ernst Müller. With Thirty-two Illustrations by J. Weber, and one Map. Pp. 68. *Price* 1*s.*

Nos. 153, 154, *Hohwald and its Environs, in the Vosges Mountains.* By Fritz Ehrenberg. With Twenty-three Illustrations by J. Weber, a Map, and "Hohwald Indicator." Pp. 52. *Price* 1*s.*

Nos. 155-158, *Through the Bernese Oberland.* By F. Ebersold. With Seventy-six Illustrations and one Map. Pp. 147. *Price* 2*s.*

Zurich: The Art Institute, Orell Füssli.

These are special guide-books to the health-resorts and districts named—Nervi on the shores of the Mediterranean, and Spiez and the Kanderthal in the Bernese Oberland, Hohwald on the Vosges Mountains, and the Bernese Oberland itself. The authors have the important qualification of intimate local knowledge. They avoid the mistake most commonly made by the writers of guide-books—that of going into too much detail. They conduct the traveller easily and pleasantly from place to place, pointing out the things most worth seeing, and giving all necessary information as to the means of communication—a matter of the very greatest importance. In this they are greatly assisted by the excellent illustrations, especially the panoramic mountain views, and by the maps, though the number of these latter might with advantage be increased.

The Atlantic Ferry: its Ships, Men, and Working. By Arthur J. Maginnis, M.I.N.A. Popular Edition. London: Whittaker and Co., 1893. Pp. 208. *Price* 2*s.* 6*d.*

We have here an attractive account of the Transatlantic steam trade, with illustrations showing celebrated steamships, from the *Sirius*, which, in 1838, was the first British steamer (703 tons, and with paddle-wheels) to cross the Atlantic, to three-funnelled screw steamers like the *Normannia*, built in the Clyde in 1890 for the Hamburg-American Line, and of 8250 tons each. The "Men who made the Atlantic Ferry" receive due recognition—Sir Samuel Cunard, Sir George Burns, David and Charles MacIver, Robert Napier, E. K. Collins, William Inman, S. B. Guion, John Burns, T. H. Ismay, James Spence, Sir Edward Harland, J. R. Thomson, John Elder, A. C. Kirk, and others, men who have built up the magnificent system of commerce which now exists between Europe and North America. As a summary of the Translantic steam trade, this little work will probably be found unequalled.

Cassell's Gazetteer of Great Britain and Ireland, being a Complete Topographical Dictionary of the United Kingdom. With numerous Illustrations and sixty Maps. Part I.: A—Amwell. London, Paris, and Melbourne: Cassell and Co. 1893.

As far as we can judge, this gazetteer seems likely to prove a useful compilation. The names of towns, villages, etc., are taken from the Census returns, and to these are added physical features, places of historical interest, etc. We must postpone a full criticism of the contents until more of the numbers are published. It is rather a glaring mistake to give Burntisland as the nearest station to Aberdour which has now one of its own.

NEW MAPS.

EUROPE.

REGNO D'ITALIA, Carta Politica Speciale del ——, colla indicazione delle Circoscrizioni Amministrative (Comprese quelle dei singoli Comuni) e delle nuove Circoscrizioni dei Mandamenti e dei Collegi Elettorali e colle Tabelle di altre importanti Circonscrizioni Territoriali alla Scala di 1 : 500,000. Costruita e disegnata da G. E. Fritzsche su dati riveduti da L. Grimaldi Casta della Direzione Generale di Statistica. Dedicata al Comm^re^ Luigi Bodio, Direttore Generale della Statistica del Regno. *Eseguita e pubblicata dall' Istituto Cartografico Italiano, Roma*, 1893.

The recent changes in the administrative, judicial, and electoral divisions of Italy made it necessary to publish a map, showing the exact boundaries of the 8253 communes of the country. The Istituto Cartografico Italiano has, therefore, issued the present work in twenty sheets, giving the detailed divisions of the kingdom, with the names of towns and villages distinctively printed according to the number of their inhabitants and their political importance. Besides the hydrography of the country, the map contains a complete network of railways, roads, and footpaths. Numerous figures show the altitude in mètres of the country above sea-level. The map was begun in 1884 on Gauss' projection, the meridian being that of Rome. The execution is good, and shows a great advance in Italian cartography.

AFRICA.

MASHONALAND, MATABELELAND, KHAMA'S COUNTRY, etc.—The British South Africa Company's Territory, South of the Zambesi. 1893. Scale 1 : 1,000,000. *London : Edward Stanford.*

This map is brought up to date, and contains much valuable information. Notes are given in many parts referring to the navigability of rivers, to the land surface features, and to the geological formations. The Beira Railway, as far as completed up to July 1893, roads and telegraph lines, goldfields in course of development, and gold-reefs are specially marked and named. Altitudes are given in feet. The hills are omitted, though they might have been easily chalked and printed in brown. The map may be welcomed at the present moment, when a war with Lobengula, the chief of the Matabele, is in progress.

MATABELE OUTBREAK, Map to illustrate the——. *Edinburgh : W. and A. K. Johnston. Price 6d.*

A useful companion to the newspaper. Roads and telegraph lines should have been indicated.

OCEANIA.

OCEANIA, Map of ——.
VICTORIA, General Map of ——.
NEW SOUTH WALES, General Map of ——. By D. Macdonald, C.E.
SOUTH AUSTRALIA, Map of ——.
TASMANIA, General Map of ——.
NEW ZEALAND, Map of ——. North and Middle Island. 2 sheets.
FIJI ISLANDS, Map of the ——.
NEW GUINEA, Map of ——.
Picturesque Atlas Publishing Company, Limited, Sydney and Melbourne. Australasian Publishing Company, London.

These maps are very clear, but in a style not much in favour in Europe. Most of them bear the date 1888, and need, therefore, considerable revision. In New

South Wales the great mining place, Broken Hill; in Victoria the irrigation colony of Mildura; and in South Australia Renmark, the last two on the river Murray, are omitted. New Guinea has a very sketchy appearance—although based on data supplied by the Geographical Society of Australasia—and needs a thorough overhauling in the British as well as in the German portion.

KAISER WILHELMSLAND UND BISMARCK ARCHIPEL, Massstab 1 : 1,000,000. (Reduced copy on scale 1 : 4,000,000. *Price* 60 *Pf.*)

Berlin: Deutsche Kolonialgesellschaft.

This is the second wall-map of a German colony which has been published by the German Colonial Society. It is similar in scale and style to that of German East Africa, and contains, besides Kaiser Wilhelmsland and the Bismarck Archipelago, the whole of British New Guinea. All the available data for the interior, as well as the latest coast surveys, have been used in its compilation. The coasts of New Britain (Neu Pommern) and New Ireland (Neu Mecklenburg) differ considerably from the old maps. For the northern coast of New Britain the Colonial Society has been able to avail itself of the surveys made by Admiral von Schleinitz. Thursday Island, in the Torres Strait, so well known as a post and telegraph station, has been omitted. The Society deserves great credit for the publication of this work.

ATLASES.

KIEPERT'S GROSSER HAND ATLAS.—Neue Lieferungs-Ausgabe in 45 Karten. Dritte, im Zeichen-Institut der Verlagshandlung unter Leitung von Dr. R. Kiepert teils vollständig neu bearbeitete, teils gründlich berichtigte, Auflage.

Berlin: Dietrich Reimer (Inhaber Hoefer und Vohsen). Price 4*s. a part.*

Dr. R. Kiepert has issued the first part of a new and revised edition of his father's well-known *Hand Atlas*. It contains five maps: Hannover und Schleswig-Holstein (1 : 1,000,000), Dänemark und Süd-Schweden (1 : 2,000,000), Nordwestliches Africa (1 : 5,000,000), Nord-America (1 : 20,000,000), and Mittel-America und West-Indien (1 : 8,000,000). Each map is accompanied by an index and by letterpress, containing the latest statistical information of each country, compiled by Dr. Paul Lippert. The maps are carefully brought up to date, and well printed.

L'ANNÉE CARTOGRAPHIQUE. Supplément Annuel à toutes les publications de Géographie et de Cartographie, dressé et redigé sous la direction de F. Schrader, Directeur des travaux cartographiques de la Librairie Hachette et C^ie^. Deuxième Supplément, contenant les modifications Géographiques et Politiques de l'Année 1891. *Paris: Librairie Hachette et C^ie^. Price* 3*f.*

This is the second annual supplement issued by F. Schrader, and contains three sheets. The first is devoted to Asia, and represents the journeys of General Pevtsoff and K. Bogdanovitch in Tibet during 1889-90 on three maps, and those of Lord Lamington, M. Pavie and other French travellers in Indo-China. The progress of African cartography is exhibited in the second sheet. The new boundaries in Central and East Africa are laid down according to the recent agreements, and the results of the explorations between the Congo and Lake Chad by French and Belgian officers, of the British officials of the Company in British East Africa, of Brichetti-Robecchi in the Somal peninsula, and of French travellers in Madagascar are reproduced. On the American sheet we find the unexplored regions of Canada and the various changes of boundary, actually effected or demanded, in Colombia, Brazil, Ecuador, etc. M. Coudreau's itineraries in French Guiana are also of interest. The maps are clear and well printed, and are accompanied by an explanatory letterpress.

THE SCOTTISH GEOGRAPHICAL MAGAZINE.

ANNIVERSARY ADDRESS.

(*Read at Edinburgh, November 17th*, 1893.)

INDIA, PAST AND PRESENT.

By General Lord Roberts, V.C., G.C.B., G.C.S.I., G.C.I.E.

(*With Maps.*)

In comparing India as I first knew it in 1852 with the India of to-day, it seems desirable in the first instance briefly to refer to the rise and rapid extension of British rule in the East, and to explain how, towards the close of the East India Company's administration, the course of events within India itself, in combination with other causes, led the native troops of the Bengal Presidency to make that attempt to throw off their allegiance to their European masters, known as the great Mutiny of 1857. I would wish particularly to dwell on this occurrence, as, in my opinion, it greatly accelerated the marvellous changes which have taken place in India during the latter half of the present century.

As pointed out by Captain Mahan, of the United States Navy, in his admirable works on the influence of sea power upon modern history, and by my friend Sir Alfred Lyall in his no less admirable handbook entitled *The Rise of the British Dominion in India*, our rule in the East primarily depends, and has always depended, on our naval superiority to the European nations whose interests in this part of the world are opposed to ours. The Portuguese were the first to establish settlements and factories on the Indian coast-line. As their maritime power declined, the Dutch and English, who at that time were nearly equal in naval strength, engaged in a protracted struggle for that Eastern trade regarding which Sir William Davenant remarked two centuries ago: "Whatever country can be in full possession of it will give law to all the commercial world." During her repeated wars with Great Britain and France the sea power of Holland gradually deteriorated, but that of France

increased, the result being that from 1744 to 1783 France endeavoured by force and intrigue to drive us out of India. For some time the issue was doubtful, but, so soon as our naval supremacy was firmly established, it became impossible for the French to maintain a contest in which their troops were isolated, while ours possessed secure means of communication with their base in Great Britain.

Our first settlements were necessarily on the seaboard—at Bombay, along the Coromandel Coast, and on the banks of the Hooghly. The distance of these settlements from each other, the difficulty, if not impossibility, of communication between them except by sea, and the fact that the interior of the country consisted of a number of Native states which, though to some extent subordinate to the Mogul dynasty, were suspicious alike of each other and of us, led to the formation of three distinct Presidencies, which at first were equal in importance and mutually independent. The decline of the Mogul Empire, the unwarlike nature of the inhabitants of the Lower Provinces of Bengal, and the military and administrative genius of Clive, enabled the East India Company rapidly to extend its territorial limits over Bengal and Behar. In the Madras Presidency Clive obtained a grant of the Northern Sirkars from the Mogul Emperor, Shah Alam, but our further progress inland was impeded by Hyder Ali (who had forcibly seized Mysore), and by the hostility of the Nizam and the Marathas. In the Bombay Presidency the only points we held were Bombay itself, Salsette, Bassein, and the fort of Surat.

Clive left India for good in 1767, and, after a five years' interval of gross maladministration, was succeeded as Governor of Bengal by Warren Hastings. Under the sagacious and intrepid rule of this statesman our possessions were extended and our power consolidated in Bengal, and the attacks made by the Marathas and Hyder Ali on our settlements in Madras and Bombay were met and repulsed.

In 1774 the Governor of Bengal was first appointed Governor-General of India, but he was not given sufficient authority over his own Council, and his powers in dealing with the other Presidencies were ill defined. The difficulties which Warren Hastings had thus to contend against are clearly pointed out by Sir Alfred Lyall in the following words :—"The two minor Presidencies of Bombay and Madras were governed by rash, incompetent persons who were exceedingly jealous of the Governor-General's superior authority, who disregarded his advice or orders, and thwarted his policy ; while Hastings himself was hampered by opposition in his own Council, and by enemies at headquarters in London." The evils of such a system were so apparent that in 1784, the year before Warren Hastings finally quitted India, Pitt carried an Act through Parliament vesting the chief government in the Governor-General, assisted by a Council of three members, with full authority over the minor Presidencies in matters of diplomacy, war, and finance. In 1786 a supplementary Act was passed empowering the Governor-General to act independently of his Council in cases of emergency.

Under Lord Cornwallis, who was the first Governor-General under these Acts, and who was also Commander-in-Chief, there was a strong

inclination on the part of the East India Company and of the Home Government to put a stop to the continual expansion of the Company's territory. Nevertheless, the circumstances of the time were such that a war had to be undertaken against the ruler of Mysore, the result being that a considerable portion of that state, including the Malabar coast, was ceded to the Company, and became part of the Madras Presidency. About this period the French Revolution took place ; and when Napoleon came into power he perceived that he could strike a fatal blow at England's wealth and commercial prosperity by depriving her of her Indian possessions. As a preliminary he occupied Egypt, with the avowed intention of hunting the English out of the East and cutting the Isthmus of Suez. He also promised assistance to Tippoo Sultan, who had succeeded his father, Hyder Ali, as ruler of Mysore. Napoleon's schemes, however, were brought to naught by Nelson's victories, which gave Great Britain for many years an undisputed mastery on the sea, and thus enabled her to develop her Eastern and Colonial Empire.

The Marquis of Cornwallis was succeeded in 1798 by the Earl of Mornington (afterwards Marquis Wellesley), during whose able administration measures were taken to establish our ascendency over Mysore, Oudh, and the Maratha States of Central India. In carrying out these measures the Governor-General was fortunate enough to have at his disposal the military and political talents of his illustrious brother, Arthur Wellesley (afterwards Duke of Wellington), and of Lord Lake ; and while the objects in view were attained with rapidity and certainty, at no time in the history of the British in India was there harder fighting or more arduous marching. Tippoo Sultan lost his life at the siege of Seringapatam, and the hostile Mohammedan dynasty which he represented was replaced by the Hindu dynasty which his father had ousted from Mysore. The Vizier of Oudh ceded his frontier provinces to the Company in return for the troops maintained for his protection. The predatory Maratha chiefs were defeated in the field and brought under proper control ; and Sindhia, who was the most powerful and aggressive of them all, was obliged to dismiss his French officers, and to hand over to the British Government the city of Delhi and the custody of the Mogul Emperor. Sindhia's frontier districts along the river Jumna and the territory he had acquired on the west coast were also transferred to the East India Company.

It is interesting to note, when reviewing the rise of the Marathas and other races in India, how much their power was due to the employment of Europeans to train and lead their armies ; in fact, most of the success achieved by Native states during the past one hundred years can be directly traced to the influence of the foreigners in their employ.

About the latter end of the last century the struggle between the French and English in the Karnatic, and between the Marathas and Mohammedans in Northern India, brought to the front a number of European adventurers, who found their way to the courts of Native princes, and in many cases succeeded to the command of large armies. We read that "the chiefs, convinced by painful experience of the great value of

military organisation and discipline, and believing that if they could but introduce such discipline among their troops they would secure the advantages which had given success to the Europeans, willingly entertained such adventurers, or even deserters from the French or English troops." Among these soldiers of fortune I may mention De Boigne, Perron, George Thomas, and Walter Reinhard, better known by the natives as "Sumroo," the husband of the famous Begum Sumroo. Of De Boigne it is said: "He raised the power of Madhajee Sindhia to a pitch that chief could never have expected or seriously hoped for, and fixed it on the basis of a powerful, well-disciplined, and well-paid army."

De Boigne's successor, Perron, came to India as a petty officer in a French man-of-war, and we read that in 1800 "General Perron had now succeeded in bringing all Hindustan under subjection; and every Raja and Subah from the Nerbudda to the Sutlej regarded him as lord and master."

George Thomas and Walter Reinhard are equally remarkable examples of how uneducated Europeans came to the front when leaders were wanted to organise and control the military element as it then existed in India. We are told that George Thomas was "dictator in all the countries belonging to the Sikhs south of the river Sutlej;" while Walter Reinhard was twice made Governor of Agra by a Mohammedan Emperor, who assigned to him for the maintenance of his troops the principality of Sirdhana, a tract of country in which the well-known cantonment of Mirat is situated, and which extends in length from Mozuffarnagar to Aligarh, and in breadth from the Jumna to the Ganges.

Time will not admit of my noticing in detail the many other European adventurers who achieved distinction during this period; but the names of Raymond Martine, Dudernaig, and Hessing, and in later days of Ventura, Allard, Court, and Avitabile, ought not to be omitted from the list. There can be little doubt that the resistance which our troops met with in the time of the Marquis Wellesley, and in our days during the Sutlej and Punjab campaigns, was due in a great measure not only to the fighting powers of the Marathas and the innate courage of the Sikhs, but to the organisation and discipline which had been instilled into those troops by their European commanders.

At the close of Lord Wellesley's administration the British dominion in India had been established on a permanent basis, the system of civil government of which Warren Hastings and Lord Cornwallis had laid the foundation had been thoroughly organised, and the only territories still left entirely independent of the Company's influence and control were the Punjab, the Indus Valley, and Nepal.

When the Marquis Wellesley left India another period of reaction set in, and an attempt was made by several succeeding Governors-General to avoid further territorial acquisitions, and to abstain from intervention in the affairs of the principal Native states. This attempt was only partially successful, inasmuch as the adoption of an attitude of neutrality and inaction encouraged the more ambitious and predatory of the states which we left to their own devices to aggrandise themselves at the expense of their neighbours, while the weaker and less warlike

states naturally looked to us for the protection which it was alike our interest and our duty to afford. We were thus (while the Marquis of Hastings was Governor-General) involved in a war with Nepal from 1814 to 1816, and in a war with the Marathas and Pindaris from 1816 to 1818, the result of the former being the annexation by the Company of a considerable strip of territory from the watershed of the Himalayas to the river Jumna, and the result of the latter being the extermination of the Pindaris and the final settlement of the Maratha States of Central India within well-defined limits. Moreover, from this time dates the full recognition of the principle that the external relations of every Native state in India should be subjected to British control, and its internal affairs regulated in conformity with the advice of the suzerain Power.

In 1824 (in Lord Amherst's time) the encroachments of Burma along the Brahmaputra river and on the Arakan coast led to the first Burmese War, the result being the incorporation of the Arakan and Tenasserim provinces of Burma with the British dominions, and the recognition of our supremacy over Upper Assam, Kachar, and Manipur.

In 1837 (when Lord Auckland was governing India) the Shah of Persia advanced claims to the western districts of Afghanistan, and the Afghan Amir, failing to obtain assistance from the Government of India, entered into negotiations with Russia—a significant fact when we remember that at that time the nearest Russian troops were at Orenburg, distant about 1500 miles from Kabul, while Orenburg was 900 miles from its base, Moscow, with which it was not, of course, connected by railway, as it has been for the last seventeen years. The Home Government was alive even then to the fact that the independence and integrity of Afghanistan are essential to the security of India, and it was determined to conclude a treaty with Ranjit Sing, the ruler of the Punjab, for the purpose of reinstating Shah Shuja on the Afghan throne. Shah Shuja was the legitimate descendant of Ahmed Shah Abdali, the Saduzai, and thirty years before had sought a refuge in our territory from the vengeance of the Barakzai usurper, Dost Mohammed Khan, the grandfather of the present Amir of Afghanistan. The object in view was effected without difficulty, and for two years British and Native troops occupied the country round Kabul and Kandahar. Owing, however, to the length and difficulty of our communications, and to the jealous and obstructive attitude of the Sikhs, who interposed between our base and our field army; owing also to political blunders and military incapacity, and last, but not least, to the inability of Native soldiers drawn from Bengal and Southern India to withstand the hardships of a rigorous northern climate, or to cope with the more martial and hardy races which inhabit the trans-Indus uplands, the British force was destroyed in its retreat from Kabul; and although we subsequently recaptured that city in the autumn of 1842, we eventually evacuated the country, and abandoned for the time an enterprise the difficulties of which were so considerable as almost to ensure its failure.

In 1843 an expedition was directed against the Amirs of Sind, and the lower Indus Valley was brought under British rule.

Two years later the first Sikh War broke out. Ranjit Sing, the powerful and astute ruler who had governed the land of the five rivers for nearly forty years, and who had always been on good terms with us, died in 1839. The Punjab fell into hopeless confusion, and when the formidable Sikh army crossed over to our side of the Sutlej we were forced to fight and disperse it. This war ended in the cession of territory, the reduction of the Sikh army, and the appointment by the then Governor-General, Lord Hardinge, of a British Resident at Lahore, with powers of control and general superintendence over the Native administration of the Punjab.

In 1848 and 1849 (Lord Dalhousie had then taken over the reins of government) the second Sikh War took place. The attempt to govern the Punjab by a Sikh Protectorate broke down, and the leaders of the Khalsa army, influenced by a corrupt Council, believed themselves strong enough to drive us out of the country. The result of this war was the complete overthrow of the Sikh army and the annexation of the Punjab.

In 1852, owing to the King of Burma obstinately refusing us reparation for the ill-treatment of some European merchants at Rangoon, and the insults offered to the captain of a British frigate who was sent to remonstrate, it was found necessary to despatch a second expeditionary force to that country; the Burmese troops were defeated, and the province of Lower Burma was added to the British Empire.

Finally, in 1856, the gross misgovernment of Oudh by its native rulers decided the Cabinet in England to bring that province under the direct control of the Government of India. The work of annexation was carried out under the orders of the Marquis of Dalhousie, who was still Governor-General. It was impossible to tolerate in the midst of our possessions the misrule and disorder which were desolating one of the most fertile districts in India; indeed, it is somewhat remarkable that Oudh should have so long retained its semi-independence, as for more than half a century the advisability of its transfer to the East India Company had been seriously considered.

In 1801 Lord Wellesley remarked: "I am satisfied that no effectual security can be provided against the ruin of the Province of Oudh, until the exclusive management of the civil and military government of that country shall be transferred to the Company, under suitable provisions for the maintenance of the Nawab and his family."

In 1831 Lord William Bentinck warned the King of Oudh that, unless his territories were properly governed and the prosperity of the people duly attended to, the East India Company would assume the entire administration of the province and make the King a State prisoner.

In 1847 Lord Hardinge went in person to Lucknow, and solemnly reiterated the warning that, unless the King reformed his administration *within two years*, "the British Government would be forced to interfere by assuming the government of Oudh."

In 1851 Colonel Sleeman, the Resident, who had well-known sympathy with Native states, reported to Lord Dalhousie that the misrule existing in Oudh had become intolerable. Colonel Sleeman said

that, if our troops were withdrawn from Oudh, the landholders would in one month's time overrun the province and pillage Lucknow, its capital.

Consequently, the annexation of Oudh could not have been regarded by the population generally or by the Native Court as a sudden or unprovoked act of usurpation. Nevertheless, I have always thought that its transfer to the Company had much to say to hurrying on the Mutiny, and for this reason I have thought it desirable to take up a little of your time in showing how reluctant the rulers of India were to effect that transfer. The year after the annexation of Oudh the Mutiny broke out, and the brief sketch I have given of the progress of British dominion in India will, I hope, enable me to explain the causes to which, I believe, that Mutiny was due.

In the first place, the rapid acquisition of territory by the East India Company, and the establishment of its supremacy as the sovereign Power throughout India, were necessarily effected by military operations, and it would have been impossible to conduct these operations without making use of a considerable force of Native troops, officered by Europeans, and trained and armed similarly to British regiments. It is true that when employed in the field the Native troops were generally associated with a varying proportion of British soldiers; but the number of the latter was limited by the expense of maintaining them, the difficulty of supplying them from home, and the objections that were entertained to locking up a large part of the British army in stations which at that period were comparatively inaccessible and almost invariably unhealthy. Native troops were therefore raised in continually increasing numbers, especially in the Bengal Presidency; and, trained, disciplined, and led as they were, they achieved remarkable successes. The army in India sustained a severe check in the first Afghan War, and the disastrous retreat from Kabul doubtless shook the faith of the Sepoys in the invincibility of British soldiers when confronted with the hardier trans-Indus races. We were victorious in the first and second Sikh Wars, but on several occasions the issue of the conflict was doubtful, and the battles we won were gained after very severe fighting and great loss of life. The result was that, in the estimation of the Native troops, the prestige and relative superiority of British soldiers were somewhat diminished, and they began to look upon themselves as the originators and preservers of our ascendency in India. This feeling of equality and independence, closely bordering upon insubordination, was fostered by the manner in which the Sepoys were pampered by their officers and the civil government, and were thus led to imagine that they were the masters rather than the servants of the ruling Power. Great stress is laid on this point by a very able soldier who went first to India in 1810, and who nearly fifty years afterwards was in command of the Peshawur Brigade at the time of the Mutiny—I mean Sir Sydney Cotton. Speaking of the Native army, he says: "Whether from fear of so dangerous a machinery, or from the mistaken idea that it was best to conciliate, certain it is that the troops were petted to such a degree that it may even be said that a premium was held out to them on insubordi-

nation. During the time of Lord William Bentinck flogging in the Native army was abolished, or nearly so, whilst in every part of the country Sepoys were cantoned with European troops, and witnessed the degrading punishments inflicted upon them, whilst they (the Natives) were exempt. In every shape and form that the mind of man could contemplate were these Sepoys indulged in the most extravagant manner."

Directly mercenary troops believe themselves to be indispensable they begin to intrigue, and are ready to throw off their allegiance to the alien Power which they neither fear nor love. This is especially true of Asiatics.

Another cause of the Mutiny I believe to have been the excessive age of the general, staff, and regimental officers of the Indian army, due to their promotion under a strict system of seniority, without any age limit for the several ranks. As Lord Rosebery points out in his excellent *Life of Pitt*, seniority in the army often spells senility, and brigadiers of seventy, colonels of sixty, and captains of fifty years of age could hardly be expected to perform their military duties with the activity or enthusiasm of younger men. Moreover, in the pre-Mutiny days Native regiments had not only a full establishment of native officers, but the same nominal establishment of British officers as regiments of the Queen's service. In addition, British non-commissioned officers were attached to each Native corps. The result was that in peace time the majors, captains, and subalterns had little to do except to vegetate in some isolated station, and the absence of any incentive to exertion or mutual emulation inevitably produced deterioration in the tone and efficiency of the officers of the Indian service. Then again, while the dominions of the East India Company were being steadily extended, it was necessary to augment periodically the Native army by the formation of fresh regiments, to organise which the more active and enterprising officers were taken away from their own corps, while the strength of the Native army was increased out of all proportion to the British garrison. In fact, at the time immediately preceding the Mutiny, the Native army had been raised to over 230,000 men by the formation of the Oudh irregular force; and it was then, as it had been for several years previously, the chief object of every ambitious and capable officer in the Native army, either to be transferred to an irregular corps or to obtain political or civil employ, and thus to escape from a career in which mere seniority was all-important, and ability and professional zeal of but little account.

Yet another cause of the Mutiny was the diminution of the obligatory European garrison of India in order to meet the requirements of the Crimean and Persian Wars. Lord Dalhousie was of opinion—and there can be no doubt as to the correctness of his views—that the annexations and conquests which had taken place during his tenure of office necessitated an increased proportion of British soldiers and a decrease of the regular Native army. No attention, however, was paid to his representations on this subject by the responsible authorities in England. In 1854 he solemnly warned her Majesty's Government that the essential element of our military strength in India was the presence of an adequate

number of British troops, and he strongly deprecated the withdrawal of a single European regiment either on account of the war with Russia, or for operations in the Persian Gulf. In spite of his remonstrances two regiments were ordered to England, and, notwithstanding the promises of the Home Government, they were not replaced; and of the remaining regiments four were employed out of India in the war with Persia. The result was that just before the Mutiny the total British force available in India did not exceed 34,000 men.

As a still further cause of the Mutiny I put down the various annexations which had lately taken place, and the general feeling of unrest and alarm which the spread of education, the introduction of railways and telegraphs, and similar civilising agencies, had produced on the Native mind. The annexation of Oudh especially, though too long delayed in the interests of justice and good government, had, as I said before, much to do with the Mutiny. The introduction of the revenue settlement system which had been established with considerable success in the North-West Provinces by the Lieutenant-Governor, Mr. Thomason, though probably it had nothing to say to the Mutiny, certainly set the great landholders of Oudh against us when that terrible event took place. It was, however, to the Sepoys that the annexation was particularly distasteful. The great majority of our Native soldiers came from Oudh, they were attached to their own dynasty, and they liked when on leave to return to their misruled province, where the money they had been able to save, and the prestige they had acquired from having served in distant lands, enabled them to lord it over their countrymen, and probably to profit by the lawless condition of the country. The introduction of law and order, following upon the annexation, necessarily led to the disbandment of the Native troops kept up by the King of Oudh, and also threw out of employ the numerous semi-military retainers of the principal Talukdars. These classes, naturally enough, resented the action which deprived them of a livelihood; and as many of them belonged to the same race as that from which most of our own Sepoys were drawn, their feeling of discontent was doubtless shared by the latter.

Once the Sepoys showed symptoms of open mutiny, they were not left long without supporters. As Sir William Hunter puts it in his admirable book, *The Indian Empire*: "The numerous dethroned princes, or their heirs and widows, were the first to learn and take advantage of the spirit of disaffection and panic." The most influential, on account of his wealth, and as being the representative of the Marathas, though fortunately for us the most incompetent, Hindu of this class in India at that time was Dundhu Panth, more familiarly known as the Nana Sahib, the adopted son and heir of the last Peshwa. The life-pension which had been given to the Peshwa in 1818 at the close of the Maratha War ceased on his death in 1851. The Nana Sahib inherited an enormous fortune from the Peshwa, but the lapse of the pension rankled in his mind, and he had tried in vain to obtain a reconsideration of the orders of Government on the subject. After failing in India, the Nana Sahib sent to England a confidential agent, a Mohammedan, by name

Azimula, who spent about three years, chiefly in London, though he visited also Paris and Constantinople. Azimula had evidently been made quite a lion of in England; this was apparent from the contents of the large number of letters found in his room in the palace at Bithur. These letters were chiefly from people in England who were even then keeping up a regular correspondence with him. Several of them had never been opened. Azimula was the leading spirit at Bithur, and was employed by the Nana Sahib in his communications with General Wheeler when that officer was occupying the hastily thrown up entrenchment at Cawnpore. Azimula's visit to England had not had the effect of making him favourably disposed towards us; for, if reports are true, he was the instrument who carried out, if not the adviser who planned, the terrible massacres which took place at Cawnpore after General Wheeler's surrender.

All the circumstances I have described prepared the way for the Mutiny, but what brought it to a head was the issue of Enfield cartridges, which were alleged to be greased with a mixture of cow's fat and lard, the one being as obnoxious to the Hindu as the other is to the Musulman. The recent researches of Mr. Forrest among the military records of the Government of India show that the lubricating material actually used was composed of this objectionable mixture, and that almost incredible disregard of the soldiers' religious prejudices was displayed in the manufacture and distribution of these cartridges. When the Sepoys complained that to bite the cartridges would destroy their caste they were solemnly assured by their officers that the cartridges were greased with an unobjectionable mixture of mutton fat and wax. These officers, knowing how cow's fat is abominated by Hindus, did not believe that the authorities could have allowed it to be used. Nothing was easier than for the regiments quartered near Calcutta to ascertain from the Native workmen employed in manufacturing the cartridges in the arsenal at Fort William that the statement made by their officers was not in accordance with facts. The news spread rapidly throughout the Bengal Presidency, and the Sepoys were prepared not only to suffer severe punishment rather than contaminate themselves by biting the cartridges, but to lend a ready ear to the sedition-mongers who were at work then as they are now, and who persuaded them that the Government they served and the officers who commanded them had entered into a deliberate conspiracy to outrage their religious belief and render them outcasts among their fellows.

Having thus indicated what, in my judgment, were the causes of the Mutiny, I will endeavour briefly to describe the general state of the country at the time, and the remarkable changes which followed that terrible catastrophe. I landed in India and joined the Bengal Artillery at Dum-Dum near Calcutta in 1852. I can therefore speak from personal observation of events subsequent to that date. Life in India was then much the same as it had been at the beginning of the century. My father, who arrived in Calcutta in 1803, and who, fifty years later, commanded the Peshawur Division, used to say how little India had changed during that period, except, of course, in the ex-

tent of territory under the control of the East India Company. In 1852, the mode of travelling was almost as primitive as it had been a hundred, or probably five hundred, years before. Private individuals chiefly used palankins, while officers, regiments, and drafts were usually sent up-country by the river route to Dinapur, Benares, Allahabad, and Cawnpore. This was necessarily a slow method of progression; how slow may be imagined when I tell you that it took me nearly three months to travel from Dum-Dum to Peshawur. I went by water to Benares; by horse dak from Benares to Mirat; and from Mirat to Peshawur, a distance of 600 miles, I was carried in a palankin. The metalled road ended at Mirat. The post was carried by runners over the greater part of India, and letters from Calcutta to Peshawur, a distance of nearly 1500 miles, took about twelve days *en route*. There was only a monthly mail with England, and less than 15 millions of letters passed through the Indian post-offices annually, instead of nearly 180 millions as at present. Little had been done in the matter of railways before I reached India, and the only line completed was that between Bombay and Tanna, about 20 miles in length. Even in 1857, the year of the Mutiny, only 273 miles were open for traffic. Now there are nearly 17,000 miles of railway in India, and upwards of 600 miles in Burma alone. There was no telegraph in India when I landed, and even in 1857 there were only 4044 miles of telegraph throughout the country. Now there are over 40,000 miles.

Although the telegraph was still in its infancy when the Mutiny broke out, what there was of it was of incalculable value during those anxious times. Along it, on the afternoon of Monday the 11th May, the news was flashed from Delhi to all stations in the Punjab that an outbreak had occurred at Mirat the previous evening; that some of the troopers had reached Delhi that morning; that the regiments at Delhi had joined the mutineers; and that several officers, amongst them the Resident, were known to have been killed. This timely message reached Lahore the same afternoon, and, owing to the commendable decision and foresight of the chief civil and military officials on the spot, measures were taken to disarm the native troops quartered at Mian Mir the second morning after receipt of the news. Later in the day the news reached Peshawur, and as we were sitting at dinner in the Artillery mess-house the telegraph signaller, who was quite a boy, like most of the signallers at that time, rushed into the room, breathless with excitement, the telegram in his hand. As at Lahore, so at Peshawur, no time was lost on receipt of the terrible tidings. Fortunately for India, there were able and resolute men at Peshawur in those days, and it is worthy of note that they were, comparatively speaking, young men. Herbert Edwardes, the Commissioner, who had made a great name for himself during the Sikh War, was thirty-seven; John Nicholson, the Deputy-Commissioner, who had been a tower of strength on the Derajât frontier for some years past, was thirty-five; and Neville Chamberlain, the distinguished Commandant of the Punjab Frontier Force, who happened to be passing through Peshawur on his tour of inspection, was thirty-seven. Although the Brigadier, Sydney Cotton, was much older, being sixty-five, he was young for his years, and

considerably younger than the average of general officers then in command in India.

At that time, a young subaltern of Horse Artillery, I was officiating as Deputy-Assistant Quartermaster-General of the Peshawur Division, and in that capacity I was ordered to be present at daybreak on the 13th May at the house of Major-General Reed, who commanded the Division. There I found, besides General Reed, the four officers I have just named. I will not weary you by detailing all that took place on that eventful morning, but I cannot pass the incident by without expressing my opinion that the decisions arrived at by the experienced officers then assembled maintained peace and order in the Peshawur Valley, restored our prestige among the border tribes, greatly assisted and expedited the operations undertaken for the capture of Delhi, and did much to deter the fighting classes throughout the Punjab from throwing in their lot with the insurgents.

Time will not admit of my dwelling longer on the stirring events of 1857; so I will proceed to briefly describe the changes which have taken place since then. They are indeed marvellous, and many of them owe their origin to the foresight, determination, and administrative ability of the great statesman who had been for more than four years at the head of the Government of India when I first joined my regiment at Calcutta. The Marquis of Dalhousie had even then set his mark on the country. Canals and roads were being pushed on in various directions, and the great network of railways and telegraphs which now intersects the country was to a great extent planned before the close of the reign of the Governor-General to whom India owes so much of its present prosperity. The crisis which occurred in 1857 gave an unexpected impulse to the works which that wise ruler had initiated, and developed the improved system of civil administration which he had introduced. And here I would ask you to look at the maps of India in the years 1760, 1784, 1805, 1857, and 1893, showing the British, French, Dutch, and Portuguese possessions at these several dates. The two later maps show also the railways completed in the year of the Mutiny and in the present year. These first four maps have been enlarged, with Sir Alfred Lyall's kind permission, from those illustrating his work on *The Rise of the British Dominion in India*. I would also ask you to glance at the map indicating Russia's position in Asia in 1857 and in 1893.

Apart from the extension of railways, telegraphs, and canals, and the general spread of civilisation, education, and prosperity throughout the country, the main changes that have taken place in India since 1857 are as follows:—

The government has been transferred from the East India Company to the Crown, and a Cabinet Minister, the Secretary of State for India, with a Council of experienced Indian civilians and soldiers, has been appointed to deal with the affairs of our Eastern Empire.

The British garrison has been raised to a strength of about 70,000 men, and the Native troops have been reduced to an aggregate force of about 150,000. Or, in other words, the Native troops have been decreased by over a third, while the British troops have been doubled.

The whole of the artillery, with the exception of a few mountain-batteries, is in the hands of Europeans, and all the arsenals, magazines, and forts are garrisoned by British soldiers.

The system of promotion in the Indian service is still one of seniority, but in practice this system has been modified so as to admit of the most capable and deserving officers being selected for the more responsible regimental and staff appointments and commands in each Presidency. But unfortunately a restriction still exists which prevents the transfer of officers from one Presidency to another, and thus greatly hampers selection.

A scheme has been devised for utilising a portion of the forces maintained by the feudatory princes of India for purposes of Imperial defence.

Baluchistan and Upper Burma have been included in the British dominions.

The principal Indian seaports have been fortified, and measures have been taken to strengthen the north-west frontier by strategic railways, roads, arsenals, and entrenchments.

Meanwhile, Russia has not been idle. Since 1857 she has advanced her Central Asian frontier some 800 miles nearer India, until, at the present moment, it is conterminous with the northern frontier of Afghanistan. This rapid movement in the direction of India gave rise to complications which involved us in hostilities with the Amir Shir Ali, and in 1878 it was found necessary to despatch a second expedition into Afghanistan. After having occupied the country for nearly two years our troops were withdrawn, and in 1880 the present Amir, Abdurrahman Khan, was placed upon the throne, receiving a guarantee from us that we would maintain the integrity of his dominions in the event of unprovoked foreign aggression, provided that he was guided by us in his external policy. A few years later the northern boundary of Afghan territory was formally demarcated by a joint Anglo-Russian Commission.

Much has been effected since the Mutiny to improve the civil administration, and to meet the legitimate demands of the Native races by gradual and judicious concessions. The provision, also, of main and feeder lines of communication by road and railway, and the construction of canals, have added materially to the area under cultivation, minimised the risk of famine, equalised the prices of agricultural produce, and developed a large and lucrative export trade.

The efficiency and mobility of the army have been greatly increased, and steps have been taken to prevent the undue preponderance of soldiers of one particular race or creed in the Native armies of the three Presidencies. With this object in view, class regiments have been formed, which are now recruited from their own particular districts.

Internally India is more tranquil, more prosperous, more civilised, and better governed than it was before the Mutiny. Externally, the rapid approach of Russia has made it more liable to attack, but, on the other hand, it has been rendered more capable of defending itself. Much, however, still remains to be done. The obsolete Presidential

system has to be abolished, and the Native troops throughout India have to be brought under the control of one Government and one chief commander. The less efficient fighting material in our Native regiments must be eliminated, and a suitable scheme devised for raising and training a sufficient reserve of Native Infantry. Above all, we must endeavour to enter into such cordial relations with the ruler of Afghanistan as will induce him to co-operate with us in making the necessary preparations to maintain the integrity and independence of that state. Afghanistan cannot stand alone. Lying as she does between two great European Powers, she must come under the influence of one or the other. So long as she is under our influence, she constitutes the bulwark of our Eastern Empire; but if she is allowed to pass under the control of Russia, she will furnish that Power with a convenient base for consolidating her strength and collecting her supplies preparatory to an attack on India. Even if it be granted by way of argument that Russia has no intention of eventually attacking India, her presence on the table-land bordering the Indus Valley would constitute an intolerable political embarrassment and a perpetual military menace. It would, moreover, entail an enormous increase of expenditure on our army and our frontier defences. The question is one which should be looked at from a broad and common-sense point of view, and not from a purely Indian standpoint; but it would be folly to ignore the fact that British interests in the East conflict with those of certain other European Powers, and it is only "when a strong man armed keepeth his palace" that "his goods are in peace." The defence of India is a question of European politics, and, as has been wisely said, the key of that country is not on the Afghan border but in Downing Street.

There are three dangers to which our Indian Empire is exposed:—

First, the danger of our line of communication between it and the United Kingdom being interrupted. Our safeguard against this danger is our naval supremacy.

The second danger is that of internal disaffection. This can best be guarded against:

(*a*) By a sufficiency of British soldiers.

(*b*) By defensive precautions, more particularly in the matter of interior communications.

(*c*) By a properly organised Native army.

(*d*) By a system of promotion in the civil and military administration which will ensure men of resolution, insight, and activity being selected for the more important posts; and, last but not least,

(*e*) By doing all in our power to gain the confidence of the people, and to imbue them with a belief in our will and ability to maintain our supremacy in India.

The third danger is that of intrigue or open aggression on the north-west of India, and against this the only protection is a friendly, but at the same time determined and consistent, policy in our dealings with Afghanistan, a well-disciplined and mobile army in India, and a Home army capable of supplying the reinforcements of British troops which India would require in the event of war. If our foreign policy in India and at home is timid and vacillating; if we alternately advance and

retire without any preconceived idea of what we want, and of the best way of attaining it; if the British army is incapable of meeting the requirements of national defence at home and abroad, our hold on India must be of a precarious nature, and, owing to the neglect of reasonable precautions, we may find ourselves involved in a costly struggle in order to regain what we need never have lost. The whole history of our connection with India confirms the truth of these remarks. Our first contest for ascendency in the East was a maritime contest. Being successful in this, we penetrated inland, and gradually made ourselves masters of the interior of the country. But even a century ago, when our naval supremacy was unquestioned and Russia had not conquered the Caucasus or crossed the Caspian, Napoleon perceived that the British rule in India was open to attack from the north-west, and in 1807, after the battle of Friedland, he entered into an alliance with Russia, with the main object of operating against our Eastern possessions from that direction. After the fall of Napoleon, Russia again turned her attention to the East, and pushed forward in the direction of India. Having in 1828 gained a preponderating influence over Persia by the treaty of Turkomantchai, she endeavoured nine years later to interfere in Afghan affairs, and not only countenanced the Shah of Persia in his attack on Herat, but despatched an agent to negotiate with the Amir of Afghanistan. Even so long ago as 1837 her Majesty's Government made the important declaration that such interference was intolerable, and that "the welfare of our Eastern possessions requires that we shall have on our western frontier an ally interested in resisting aggression, in the place of chiefs ranging themselves in subservience to a hostile Power."

The disasters and the abortive results of the first Afghan War led several eminent statesmen and soldiers to doubt the expediency of our interfering in trans-Indus politics, and a school of thought arose, known as the "masterly inactivity" school, which held that it was wiser and safer to leave Afghanistan alone, and to devote our entire attention to the development of our resources within India itself. Lord Lawrence was one of the best-known advocates of this course of action, and at the time he was Governor-General there was a good deal to be said in favour of it. Russia was still far distant from the Afghan border, and India had lately been rent by internal commotion, the civil and military administration had been absolutely disorganised, and a great part of the Native army had ceased to exist. It was undoubtedly our first and most urgent business to put our own house in order, and to that extent it seems to me that Lord Lawrence's advice was wise and right. Were Lord Lawrence alive now, I feel sure, with our present knowledge of the geography of Central Asia, he would have changed his opinions. He and those who thought with him were persuaded that any attempt on the part of Russia to advance into Trans-Caspia would either fail, or be a most difficult, most costly, and most tedious operation. In proof of this I will quote Lord Lawrence from a memorandum written in November 1868, while he was Viceroy in India. His words were: "At first sight it may appear as if the objects described as necessary for the consolidation of Russian power in Turkestan are not difficult of attainment. But, in point of fact, they are prodigious. They

would require the expenditure of vast sums of money, which Russia has not to spend; they would occupy many years, and would probably then be liable to crumble into dust on any serious reverse of fortune." Now, we all know that Russia has effectively occupied Turkestan without much difficulty or expense, and in a comparatively brief period; and therefore the main argument adduced by Lord Lawrence in support of his contention has been completely refuted by the course of events. If the premises on which Lord Lawrence's argument was based had been correct, his conclusion would have been sound. Defective information, however, induced him to assume that the deserts of Central Asia would oppose an insuperable barrier to the advance of a civilised Power towards India from the north-west. As I have just said, I think it almost certain that more accurate information would have led Lord Lawrence greatly to modify his views, and in this opinion I am confirmed by a very remarkable memorandum written in 1878 by the late Lord Napier of Magdala, who had been Lord Lawrence's intimate friend, and at one time a cordial supporter of his frontier policy. After remarking that he had no objection to his former views in favour of inaction being quoted in the House of Lords, provided it were also stated that circumstances had so completely changed as to justify him in a change of the views he had expressed ten or twelve years before, Lord Napier referred to the rapid advance of Russia, and pointed out the danger of adhering to a line of policy which the progress of events had rendered obsolete. He said:—"Our policy of masterly inactivity, or rather receding from every difficulty until what were matters easy of suppression have grown into serious dangers, has continued too long, and if it is maintained will lead us to disaster. It has been frequently asserted, by people with pretensions to speak with authority, that we shall be secure if we remain within our mountain boundary. But this is at variance with all history. A mountain chain that can be pierced in many places is no security if you hide behind it. India has often been entered through her mountain barrier, which was never defended. India waited to fight the battle in her own plains, and invariably lost it."

Ladies and gentlemen, I must now bring this lecture to a close by thanking you for the attention with which you have listened to me. I will only say, in conclusion, that I have long and deeply studied how best to defend the British Empire in India against the three dangers to which it is exposed—the maritime, the internal, and the frontier danger; and I have such a belief in the intelligence and common sense of my countrymen, that I feel confident they will arrive at a sound conclusion, if only they will make themselves acquainted with our actual position as an Eastern Power, and duly appreciate the lessons which may be gathered from past history and experience. The British nation will, I trust, perceive how vitally its own prosperity is bound up with the maintenance of our supremacy in India and the extension of our trade with the East, and will consequently insist on the navy being strong enough to protect our interests and commerce; on the army at home and abroad being trained, organised, and equipped in readiness for the duties it may be called upon to perform; and, last but not least, on the Central Asian question being dealt with in a firm and consistent manner.

THE LIMITS BETWEEN GEOLOGY AND PHYSICAL GEOGRAPHY.

By Clements R. Markham, C.B., F.R.S.

(*Read at the Meeting of the British Association*, 1893.)

Knowledge is one, and its division into what we call sciences is necessary, because no human being was ever so gifted as to grasp it as a whole, and also to acquire a special acquaintance with all its parts. A division of labour is inevitable, and the bounds of each division must be more or less arbitrary. At the same time, there is no reason why those limits should not be fixed by common agreement, and upon grounds that would receive assent from expert and intelligent criticism.

In considering the boundary-line between geology and physical geography, I approach the subject as a geographer, and I look at it from a geographical point of view; but if my conclusions are in the main correct, they will be accepted by geologists, because, although our points of vision are not the same, the impressions we receive are caused by identical phenomena. From a central geographical position I believe that we may define the limits of our science, distinguishing between the subjects which are within our boundary and those which, although clearly belonging to another division of knowledge, are still pertinent to our inquiries.

I have no doubt of the utility of such definitions. While each seeker after knowledge should work within the defined limits of his own special science, it should also be his aim to generalise, and to bring out its relations with other spheres of inquiry. In both lines of study and of thought he will receive assistance from clear and acknowledged definitions of the scope of each science; for he will thus find guidance with regard alike to the methods and to the extent of his researches.

The first work of geographers is to measure all parts of the land and sea, and to fix the relative positions of all places on the Earth's surface. Locality is the basis upon which all human knowledge rests, and it is the priceless gift which geography supplies to her sister sciences. We first establish the locality, and then we study the phenomena within a given area, and the changes which have taken place during historical times; that is, the changes respecting which there is human testimony in some shape or form, not necessarily written testimony. These changes generally explain to us the laws according to which similar changes are now taking place around us. This is physical geography. From the point of view of its connection with physical geography, I take geology to be a study of the condition of the Earth, and of the changes that have taken place on its surface during the cycles of ages previous to the dawn of history. Sir Roderick Murchison used to say that the geologist was the physical geographer of former periods. When he studies the phenomena of physical geography, it is to collect data which will enable him to solve

some problem of remote ages. The geologist and the geographer use the same materials, but for different purposes; the former to find interpretations of problems relating to the past, the latter to explain what is actually taking place in the present. There is thus a definite boundary between the two sciences, although, as we have seen, each has occasion to use arguments derived from the other, in order to find interpretations or explanations for its own problems.

The physical geographer certainly has to learn from geology the influence that the nature of the various rocks and their present positions has had, and still has, on the features of the Earth's surface as we now see them. For instance, the causes which decide the direction of river-beds can generally be ascertained by a study of the nature of the rocks, and of their inclinations round the fountains and along the river-courses. But the objects of such study are different from those of the geologist; and no geological facts or arguments come within the sphere of the geographer's work unless they help to explain an existing geographical feature. The aid derived by the closely allied sciences from each other does not interfere with the enunciation of a distinct limit between them. I believe this boundary-line is to be found where human testimony ceases. Geography fixes localities. It finds certain physical phenomena peculiar to each locality, and it seeks for their causes. In such research the two sciences of geology and geography are on common ground; but while the object of the former is to obtain explanations of phenomena in the remote past, that of the latter is to seek reasons, from the testimony of history, for the condition of the locality as the geographer sees it before him. Generally such human testimony is sufficient for his purpose. When it is not, he seeks for explanations within the domains of geology, of biology, of botany, of meteorology, sometimes even of astronomy; but such necessity to go further afield does not vitiate the accuracy of a definition which sets proper limits to his own science. It merely reminds him of the great truth that knowledge is one, that it is one harmonious whole, and that the divisions into special sciences are the inevitable consequence of the limits which circumscribe the powers of the human mind. Humanity must acknowledge to itself that, as knowledge extends, these limits become more evident, and subdivisions become more urgent. In common with other sciences, geography finds the necessity for specialism, while the subdivisions within itself render clear definitions of its outer limits more desirable and more useful.

My own studies have been chiefly in the direction of comparative geography, and I have sought for the explanation of existing conditions of the Earth's surface by examining the records of former centuries. On the one hand, such special studies lead to an appreciation of the necessary connection between physical and political geography; of the fact that a consideration of the influence of the configuration of the surface, of climate, and of products must form the basis of a study of the history of man. On the other hand, they furnish explanations of the existing condition of the surface, and suggest that definition of the boundary between geology and geography which I now submit.

In order to test the application of a canon intended to define the

boundary-line of the two sciences, it will be well to select some given area for the purpose. The great valleys of the Ganges and the Indus will be suitable. If we go back to the earliest human records, we shall find that the inhabitable part was confined to the water-parting between the Jumna and the Sutlej. All the rest of the present valley of the Ganges was an arm of the sea. The vast region between Delhi and Calcutta has become habitable within the historical period. As dynasty succeeded dynasty, we find the foundation of cities recorded in situations lower and lower down the valley. The physical geographer compares the records of history with what he can now see with his own eyes. The process that is going on is described by Mr. H. F. Blanford. Standing on the banks of the Ganges, and watching the turbid flood swirling past, the observer sees the *chur* opposite, which the river left dry when its waters fell at the close of the last rainy season. Until lately it was covered by a rich green crop of indigo. It is now more than half cut away and buried beneath the waters. Huge masses detach themselves from time to time, and are swallowed up by the deep, muddy stream. These are present facts. The inquirer then learns that half a century ago the river itself was only a moderate-sized *khall*, and that an old channel, 7 or 8 miles off, and now little more than a string of pools, was at that time a great river. Turning to history, he will find that the ancient records of the people gradually unfold the causes and effects of what he has seen and heard. The positions of the capitals of the different dynasties which successively reigned in the valley plainly continue the story, until the Vedas are reached. Then the whole wonderful record is unfolded through the help of human testimony. It is all within the domain of geography, up to the causes which led to the drying-up of the Saraswati. The more remote record represented by the mountains bordering on the valley, by the Sawalakh hills and their fossils, belongs to geology. Here the reasons for drawing the boundary-line between the two sciences stand out clearly defined. All that comes within the ken of human testimony belongs to geography; the earlier pages contain the changes indicated by positions of strata and the story told by the Sawalakh fossils, and are a part of the science of geology.

If we come nearer home, we see how the remarkable phenomena connected with the long battle between the land and the sea at the delta of the Rhine teaches another memorable lesson in physical geography, with the aid of history. We see what is going on now; the dunes protecting Holland from destruction, the Zuyder Zee, the numerous islands, and the tracts of reclaimed land. Human testimony explains the causes which produced the present condition of this region and the gradual changes in the course of centuries. The slow movement of the dunes is revealed to us by the statue and temple of Nehalennia, which was uncovered some years ago on the Domburg Sands. A drive of 12 miles northwards from Bruges conducts the inquirer to the little country town of Sluys, which is surrounded as far as the eye can reach with cornfields and meadows and clumps of tall trees. The student of Froissart reads how our King Edward III. gained

a great naval victory over the French fleet on this very spot. If he continues his researches and studies the histories of the great struggle between the United Provinces and Philip II. of Spain, he will find that a change had slowly but surely been taking place. Sluys is still a port, but with very different surroundings from the Sluys of the 14th century. From that time he may trace its story, with the aid of a succession of maps, down to the present day. This is physical geography explained and illustrated by the aid of history. The earlier record of the same region, when the mouth of the Rhine was somewhere in the latitude of the Orkneys, and the river-drift men tenanted what was then a part of a continent, but is now the island of Britain, as distinctly belongs to geology. The interesting facts connected with it are not ascertained by human testimony, but by other methods and for other objects. Here again we find a natural boundary-line between geology and geography, by means of which the whole body of facts relating to a locality can be logically divided between the two sciences, and conveniently classified.

History, as well as the voyages and travels of former explorers, teaches many a fact of the greatest interest to the physical geographer. At the Pass of Thermopylæ he can study the topography of the Persian campaign, and fix the spot where Leonidas made his final stand; while at the same time he can trace the progress of the extensive changes in that region down to the present day. On the rock of Mont St. Michel he can watch the progress of the high tides until the place where he stands is converted into an island. History tells him that this mount, a college of Druidesses and later a temple of Jupiter, was in the centre of a great forest, the *Sciucum nemus*, in Roman times. Here, in this very county, the native of Nottingham may descend his own river of Trent, and come to a great cultivated district which was once Hatfield Chase, a wild tract of forest and moor, intersected by water-courses and dotted with large pools and swamps. The tomb at York Minster tells us that young Prince William, the son of Edward III., met his death in Hatfield Chase; he caught an ague while hunting deer, from a boat, in the marshes. In this instance the change is due to human agency, but that change is equally a part of physical geography, and the geographer traces its progress through the study of historical documents. Still more important changes have been caused in the countries bordering on the Mediterranean, partly through meteorological agents and partly through the work of man. In many places the cactus and the aloe have usurped the ground occupied in Classic times by forests of oak and beech. We know, from the evidence of historical documents, that the mountains bordering on the garden of Murcia in Spain, which are now naked rocks rising in peaks and ridges, were once, and not longer ago than the days of Alfonso the Wise, clothed to their summits with pine-woods.

It is thus that physical geography finds most efficient assistance from human testimony for the study of the former condition of parts of the Earth's surface at different epochs. It need not always be written testimony. The splendid temples of Selinunte on the south coast of Sicily, and the direction in which they have been thrown down, are the silent witnesses to a great earthquake in the eighth century. We have

seen, too, how the statue of the goddess Nehalennia explained the direction and rate of movement of the sand-dunes of Zeeland.

It is this testimony respecting the condition of the Earth's surface at long intervals of time which gives such importance to the editing and the study of old voyages and travels. Hence every physical geographer ought to be a member of the Hakluyt Society. By careful reading, and by knowing what he wants, he will pick many a plum out of the heaviest pudding. But, in truth, the quaint old narrators of voyages and travels are very rarely dull. The student of physical geography is sure to be rewarded by their perusal. He may be giving his attention to the formation of coral islands, and perhaps meditating on the question whether Bermuda once formed a great circle enclosing a lagoon. The existing evidence is the small west rock on the western reef gradually being reduced in size by the action of the waves. Further evidence of the dimensions of this rock in former times would be important. A man named Henry May went out as a mate with Lancaster in his first voyage to the East Indies, three centuries ago. May lost his ship somewhere near Puerto Rico on his return voyage, and took a passage home in a French vessel. He was shipwrecked on the western reef of Bermuda, and his journal supplies evidence respecting that west rock. He describes that land as consisting in his time of "high cliffs." Further research may reveal its dimensions at some other period, and so help the researches of geographers; for the narrative of Bermudez, the discoverer of this coral group, is still buried in Spanish archives.

When the explorer makes new discoveries, their true significance can only be established by the testimony of history. The region round Lake Zuway to the south of Abyssinia is almost unknown, and is consequently very interesting to geographers. It was unvisited for centuries, and Mr. Ravenstein, our greatest authority on Africa, has to go back to the enterprises of the Portuguese to find any traces of it. Thus it is that we appreciate the value of the narrative of Father Alvarez, who accompanied the embassy of Rodrigo da Lima to Prester John; for one of the members of this embassy, in a journey to the southward of Abyssinia, descried the lake, which has again been revealed to us by modern travellers after an interval of three centuries.

Instances need not be further multiplied to prove that the alterations of the Earth's surface, which properly engage the attention of the physical geographer, rest upon human testimony—upon history and the records of voyages and travels. What applies to changes caused by the action of water, is equally true of the volcanic eruptions and subterraneous disturbances to which the surface of the Earth is subject. Some of these phenomena belong wholly to geology, while others have expended themselves in historic times, or are now actually at work. The great volcanic region of Auvergne belongs entirely to geology. Geography is merely concerned with it in reference to its actual physical aspects, and their relation to existing results. Its formation and history are beyond the domain of human testimony, and, therefore, of physical geography. The eruptions of Vesuvius, on the other hand, are purely geographical, although their study is important to geologists; because

the first appearance of activity took place in historic times, and its subsequent action is fully recorded. The same remark applies to the greater part of the mighty volcanic belt of fire from New Zealand to Japan.

Earthquakes compose another series of phenomena which belong to geology or to geography, as they occurred before or after the dawn of human testimony. Seismology is a department of geography, and the record of earthquake phenomena can only be completed by researches into the history of the past. The colonial records, in the Spanish archives, thus enable us to form a descriptive list of the earthquake phenomena on the western coast of South America for the last three centuries; and similar chronological series can be gathered from historical documents as regards several other parts of the world. In all these departments the line between geology and geography can be defined without strain or danger of confusion; and the result of the consideration of the question of limits, from this point of view, seems to be that it can be settled naturally and without undue concession on either side.

There are doubtless many other considerations which I have overlooked, and which should be marshalled in order, and be given their proper weight. This will be done in the course of a discussion; and the final event may modify or set aside my conclusions. I speak only as a comparative geographer, and from a special standpoint. Geologists may not improbably see the same facts from a different point of view, which will lead them to other conclusions. I believe, however, that such differences will only apply to details, and that a final conclusion may easily be reached by mutual concession. For we must recollect that, although knowledge is one, the limits of all our divisions of knowledge must inevitably represent a series of compromises.

Meanwhile, and until better instructed, I should define GEOLOGY as the study of the condition of the Earth and of the changes on its surface during the cycles of ages before the dawn of history; and I should define PHYSICAL GEOGRAPHY as a knowledge of the Earth as it is, and of the changes which have taken place on its surface during historical times. These changes, deduced from human testimony, explain to us the laws according to which similar changes are now taking place around us.

The two sciences depend upon each other and are very closely allied. The geologist finds the same phenomena in the rock formations of the past as the physical geographer discovers on the surface of the Earth of the present. Both, for example, have the duty laid upon them of seeking out the agencies which rule in the processes of upheaval and depression. The fold, with its crest and trough, is common to both sciences; and geographers have rejoiced at the announcement of "a wedding-ring of geology and geography uniting them at once and for ever in indissoluble union."

Mr. Markham's paper was read at a joint meeting of the Geographical and Geological Sections, and was followed by one by Mr. W. Topley, F.R.S., of the Geological Survey, in which the author admitted that physical geography is to a

large extent the foundation of geology, inasmuch as a geologist must study processes now in action before he can understand the manner in which rocks, now forming the Earth's surface, have been formed.

On the other hand, the existing surface features of the Earth can only properly be understood when viewed in relation to their geological structure. From this point of view geology is the foundation of physical geography. The range, shape, and character of these surface features are determined by the nature of the rocks and by the manner in which these rocks are arranged. Familiar illustrations of this point are afforded by the escarpments and valleys of England and France. It is equally apparent in the more complicated structure of mountains. The rocks of mountain ranges and their flanking hills are often contorted and inverted, so that the apparent succession is not the real one ; but even here the surface features are equally controlled by the manner in which the rocks now lie. The existing surface of the land is almost entirely due to denudation ; the manner in which this acts and the results developed vary with the nature and "lie" of the rocks.

The soils of a district have mostly been produced by the weathering of rocks, etc., at the surface. The soil, and the facility for obtaining water, have determined the original settlement of an area. The land divisions consequent on such early settlement have been equally determined, in many parts, by geological structure.

The discussion which these papers introduced contributed nothing of importance to the elucidation of the question.

THE RACES OF TRANSCAUCASIA.

By V. Dingelstedt,

Corresponding Member, R.S.G.S.

CENSUS.

The Transcaucasian Statistical Committee has just issued a very substantial work on the population in Transcaucasia, containing figures appertaining to every nationality, every creed and every class of society, as also to their distribution in towns and villages. We see from it that in Transcaucasia thirty-five different nationalities can be distinguished, composed of thirteen or more races or family-groups, such as the Slavonian, German, Latin, Pelasgian, Iranian, Hindu, Semitic, Kartvelian, Finnish, Turkoman, and Caucasian strictly so called. The total number of the population in Transcaucasia is estimated at 4,702,898 (men 2,549,969, women 2,152,929). Subdivided according to their nationalities, they are distributed as given in the subjoined table, where their relative strength is expressed in percentages :—

Russian,	2·60	Tat,	2·65
Bohemian and Slovak,	0·02	Talyshin,	1·07
Pole and Lithuanian,	0·07	Kurd,	2·13
German and Swede,	0·19	Ossetian,	1·63
Moldavian,	0·03	Armenian,	19·96
Greek,	1·18	Gipsy,	0·02
Persian,	0·23	Hebrew,	0·73

Chaldean (Aïssor),	0·05	Khvarshin,	0·03
Georgian,	8·11	Khunsal,	0·02
Tushin,	0·12	Kaputchi,	0·05
Pshav,	0·20	Kasikumykh (Laki),	1·02
Khevsur,	0·14	Artchi,	0·02
Mtiuletin,	0·05	Kaitag,	0·31
Enghiloy,	0·19	Kubatchi,	0·05
Imeretian,	9·00	Darghin,	2·28
Gurian,	1·62	Tabassaran,	0·58
Ajar,	1·26	Aghul,	0·14
Mingrelian and Lazi,	4·57	Kurin,	3·17
Suanetian,	0·29	Rutul,	0·25
Circassian and Kabardin,	0·08	Tsakhur,	0·11
Abkhasian,	1·27	Khinalug,	0·05
Tchetchen,	0·02	Udin,	0·15
Lesghian,	0·01	Gaputly,	0·07
Avar,	3·33	Jeck,	0·17
Karatin,	0·15	Kryz,	0·04
Andian,	0·17	Budugh,	0·06
Dido,	0·10	Mordvin and Esthonian,	0·03
Bogulal,	0·03	Turks,	1·50
Akhvakh,	0·07	Tartars,	24·23
Botlikh,	0·03	Karapapakh,	0·51
Godobery,	0·02	Turkoman,	0·19
Tchamalal,	0·09	Kumykh,	1·28
Tindal,	0·07	Noghai and others,	0·14

We learn further that there are in Transcaucasia seventeen acknowledged creeds, of which the Greek Orthodox and Mohammedan Sunna are predominant and have almost equal numbers of adherents, viz.—29·18 per cent. of the population are Orthodox, whilst 29·33 per cent. are Sunnites: next comes the Armenian Gregorian Church, which counts 19·47 per cent. of the whole, and the Shiah, another Mohammedan sect, with 18·59 per cent. of the population. The remaining 3·4·9 per cent. of the population are divided between ten Russian sects,[1] Catholics, Jews, Ali-Allakhi, and Yesids.

As to the class distinctions of all these different peoples inhabiting Transcaucasia, they are also pretty numerous, there being four grades of nobility, eight denominations of clergy, four classes of citizens or townfolks (honourable citizens, merchants, artisans, and discharged soldiers),[2] and six classes of peasants or rural people. The last are of course the most numerous, constituting, indeed, more than 86 per cent. of the whole population. All kinds of nobility, from princes (there are 17,766 persons with a princely title) down to *bey* and *melik*, form 3·02 per cent. of the whole population, clergy 1·12 per cent., and townsfolk 9·42 per cent.

There are in Transcaucasia thirty-one towns and about ten thousand

[1] These form 1·11 per cent. of the whole; the principal are the Molokan (from *Moloko*, milk), the Dukhoborstvo, which denies the divinity of the Holy Ghost, and the Sabbatarian.

[2] Functionaries and officers are not included, being, probably, not considered as a settled population.

villages of every description. The largest town is Tiflis, whose population was estimated in 1891 at 145,731 souls of both sexes. Afterwards comes Baku with 86,611 souls; Shusha, 26,806; Nukha, 25,894; Kutaïs, 22,643; Alexandropol, 24,230; Shemakha, 22,139; and Elisavetopol, 20,294.

ANTHROPOLOGICAL RESEARCHES.

There have been conducted of late, by the Russian Dr. T. Pantukhof, fairly thorough anthropological inquiries into the physical characteristics of the various and very numerous tribes inhabiting the Caucasus. The results of these inquiries and measurements have been presented to the Caucasian Section of the Imperial Russian Geographical Society, and have quite recently appeared in its *Mémoires*. These laborious researches are of deep interest to all who concern themselves with somatology. The Caucasus is one of the best places for the study of the physical formation of the human race, thanks to the variety, as also to the beauty and very ancient origin, of the tribes inhabiting this mountainous, and as yet not easily accessible, country. According to Dr. Pantukhof, somatological and linguistic researches in the Caucasus have proved already, beyond doubt, the existence in this country of many types and races of men, widely differing from one another in physical characteristics. These researches furnish material for some definite classification of the Caucasian peoples. Between the extreme brachycephalic races, such as the Aïssors, Hebrews, and Armenians, and the extreme dolichocephalic peoples, as, for instance, the Tats and Persians, there are in the Caucasus a considerable number of anthropologically distinct groups, as there are also many separate groups in regard to language. These distinctions appear to be very lasting and fixed, and there is as little mixture of anthropological types as there are few blendings between particular idioms. It seems that the high civilisation and culture which the remote and splendidly endowed ancestors of the present inhabitants of the Caucasus enjoyed in prehistoric times have had such a lasting and peculiar influence upon the faculties and constitution of the races, that, notwithstanding later intermingling with other nations, the actual descendants of those ancient and unknown peoples have preserved, more or less perfectly, their peculiarities. Contrary to what is observed in Europe, where the highly mingled populations scarcely preserve any distinguishing anthropological conformation, the later intermixture of various Caucasian tribes has not led to the same uniformity, and has caused but little change in the fundamental anthropological types. There has not been found, for instance, amongst Aïssors, Hebrews, and Avars, a single dolichocephalic head, as, on the other hand, there has not been found a single brachycephalic skull amongst the Tats. Dr. Pantukhof gives the percentages of the different types of skull amongst the most important Caucasian tribes. We think that the following table may be found of some interest, as it will be seen that the Russian somatologist distinguishes here three kinds of head: dolichocephalic, the ratio between longitudinal and transversal dimensions being from 1 : 0·70 to 1 : 0·77; mesocephalic, with a ratio of 1 : 0·77 to 1 : 0·85; and brachy-

cephalic, 1 : 0·85 to 1 : 0·95. We do not know exactly the number of observations :—

	Dolichocephalic.	Mesocephalic.	Brachycephalic.
Tats,	80	20	0
Persians,	70	25	5
Kurds,	50	40	10
Azerbaijans,	46	44	10
Imeretians,	30	58	12
Mingrelians,	25	59	16
Circassians,	20	63	17
Karatchai,	18	62	20
Transcauc. Tartars,	19	57	24
Abkhasians,	12	38	50
Budughs,	10	60	30
Ossetians,	7	52	41
Suanetians,	6	46	48
Tchetchens,	6	49	45
Didos,	5	46	49
Turks,	3	45	52
Georgians,	2	48	50
Kurinians,	2	47	51
Darghinians,	1	45	54
Khinalugians	0	65	35
Transcauc. Jews,	0	45	55
Aïssors,	0	44	56
Armenians,	0	40	60
Tabassaranians,	0	33	67
Kasikumykhs,	0	36	64
Avars,	0	38	62
Jews (highlanders),	0	30	70

The peculiarities of the different Caucasian tribes become even more evident when considered in other particulars.

Dr. Pantukhof gives many interesting data concerning other somatological distinctions of different Caucasian tribes, such as stature, relative disposition of the parts of the body, the circumference of the breast, the abundance or scarcity of hair, the colour of the eyes, length and breadth of the figure, length of the nose, etc.; but, valuable as they may be, we think it scarcely advisable to enter into these particulars here, seeing that the material collected is not as yet sufficient for any generalisation. We would only draw the attention of the reader to a very peculiar connection that seems to exist amongst the same race of people between the colour of the eyes and the dimensions of the body. Thus, the Russian somatologist has invariably found that amongst Georgians and Armenians blue eyes (which are far from common) are accompanied by a smaller stature and a larger head than the far more common black or hazel eyes. On the other hand, in Samursakan, inhabited by Mingrelians, grey-eyed persons are of higher stature and have larger heads than those with hazel eyes.

Dr. Pantukhof insists particularly on the importance of the study of the Jewish type in connection with the inquiry into the origin of the

ancestors of the Caucasians. According to him, the primitive Jewish type was that of the Chaldean, whose native land, according to Baron Usslar, must have been the upper valley of the Euphrates and the environs of Lake Van.

Dr. Pantukhof finds some reason to consider the Khevsurs, part of the Suanetians, and some Lesghian tribes, as of Jewish descent. The Aïssors and some tribes in Asia Minor seem also to be of Jewish origin. Head-measurements of Armenians and Georgians also point to a Hebrew origin. In any case the Caucasian Jews have very little in common with peoples of the Arabian Semitic type, whose representatives are scarce in the Caucasus, and consist only of some Abkhasian, Lesghian, and Azerbaijan tribes. Here are some average results of the measurements of Caucasian Jews:—

Average stature of 344 cases, 63·7 inches; girth round the chest, 32·7 inches; size of the head, longitudinal measurement, from 6·7 to 7 inches; transversal, from 5·15 to 5·7. From a pathological standpoint the Caucasian Jews are remarkable for the great prevalence amongst them of *favus*.

Besides the above, the Russian somatologist gives body-measurements and craniological data, with some photographic representations of all the principal Caucasian nationalities, viz.:—Aïssors, Armenians, Georgians, Imeretians, Mingrelians, Gurians, Suanetians, Abkhasians, Ossetians, Turks, Persians, Tartars, Kurds, Lesghians, and Tekke.

HAUSALAND.

By Rev. Charles H. Robinson, M.A.

There is scarcely any name in African geography which is used in so vague and indefinite a sense as the word Sudan. To very many the name suggests nothing more than a huge tract of desert or thinly populated country, forming a radius of about 500 miles around the town of Khartum. By the African native, however, the term is consistently used so as to include, in addition, the vast stretch of country to the W. and S.W. of Lake Tchad, containing a population of probably not less than 60 million inhabitants.

The chief tribes, or nations, inhabiting this district are the Hausas, Fulanis, Nupés, and Bornuese. The first of these is perhaps the finest native race to be found in the continent of Africa. They are courteous and polite in their dealings alike with strangers and with each other; they live in large well-built cities, one of which, Kano, is supposed to contain a population of no less than 120,000. The reason why up to the present so little has been known concerning them, and why their country, to a large extent, remains yet to be explored, is that they are cut off from intercourse with the coast, or rather from the approach of Europeans from the coast, by two natural obstacles of more than ordinary magnitude.

The traveller desirous of approaching their country from the south has to pass through the low marshy districts which form a wide belt on either side of the river Niger, and which have gained so ill a reputation for the malarial fevers they produce. The approach from the north, on the other hand, necessitates the crossing of the Great Sahara Desert at a point where its breadth is little less than 1800 miles.

A society, calling itself "The Hausa Association," has lately been formed for the purpose of studying the language, history, and customs of this so great, but hitherto so little known, people. As the first "student" of this Association, I have recently been engaged in making a preliminary journey of investigation along part of the border of the Great Desert at the south of Tunis and Algiers, for the purpose of ascertaining, by personal intercourse with members of native caravans, the possibility of crossing the desert either from Tripoli or Tunis. The chief difficulties which the caravans experience are, first, the extreme scarcity of water, and secondly, the liability to attack from the marauding tribes of Tuareks, who infest the northern part of the desert. The water is found in wells which are frequently mere water-holes, containing more mud than water, and too often contaminated by the putrid remains of birds or animals which have fallen into them. These wells are, in some instances, as much as a week's journey one from another, and as a camel cannot, without great difficulty, walk for more than a week without a drink, the drying up of a single well may sometimes endanger the safety, or rather the continued existence, of the whole caravan. The average pace of our camels during the journey above referred to was about two and a half miles per hour, each camel being capable of carrying from 300 to 500 lbs. The average length of a day's march is about twelve or fifteen miles, though the caravan will occasionally march without a break for fifty or sixty miles, when urged by lack of water or by fear of hostile attack. The time usually spent in the desert march from Tripoli to the border of the Hausa States is about four months; this includes an occasional halt at an oasis for a week or ten days. The maximum temperature registered in the shade, *i.e.* under the double canvas roof of our tents, on the northern border of the Great Desert, was 107° F., and this would probably be far exceeded farther to the south. The crossing of this desert, though it has been effected by several travellers of German or French nationality, does not appear to have been accomplished by any Englishman within recent years, the last being Richardson, in 1851, who did not, however, live to return.

At the present moment the route from north to south seems practically impossible, the entrance from Tripoli being closed by the persistent refusal of the Turkish authorities to allow any European to go more than ten miles outside the walls of the town, whilst the approach from Tunis, since the massacre of the Flatters expedition by the Tuareks, through whose territory it would be necessary to pass, seems almost equally impracticable. As the journey in the reverse direction, *i.e.* from the Hausa States to Tripoli, appears so much more feasible, I have accordingly decided to go round by sea to the river Niger, and ascending

its stream for about 300 miles to Lokoja, to set out from thence to Kano and Katshina, two of the chief centres of the Hausa States, returning eventually by way of the Great Desert and Tripoli. The Hausa Association has recently issued an appeal for £1600, the estimated cost of the proposed expedition, of which sum rather less than half has been as yet received. The object for which the Association has been founded, and for which the proposed journey is to be made, is to inaugurate the careful and scientific study of the Hausa people and language. The traditions of the people, so far as they have at present been collected, point to Egypt, or even to Persia, as the original home of the nation. Their language, which is the second most widely spoken in Africa, if indeed it has any rival, is radically distinct from the languages by which it is surrounded; as an illustration of which may be instanced the possession of a distinct gender termination—a termination entirely wanting in the native languages of West Central Africa. Its relation to the Semitic languages is at present an unsolved problem. Although the close resemblance of its whole pronominal system to the Arabic, and the large number of idioms common to the two languages might, at first sight, suggest a Semitic origin, the apparent absence of triliteral roots, combined with the independence of the greater part of its vocabulary, seems rather to suggest that the language existed in Africa prior to the first invasion of the Semitic people, by intercourse with whom it has been subsequently modified and developed. When it is stated that one out of every hundred people in the world speak this language, whilst no part of the Bible has as yet been produced in a form capable of being understood by the Hausa people, it will be admitted that the interest, from a religious point of view alone, attaching to the work which this Association has undertaken, is of quite a unique character. The fact that a large number of the better educated Hausas speak Arabic, in addition to their own tongue, will enormously facilitate the work of the student in gathering materials for a dictionary of the language, and in the eventual translation of the New Testament. The Association further contemplates the establishment of some permanent institution, probably in North Africa, for the continuous study of this language, and for the training of natives who, on returning to their own country, may be employed either as agents of missionary societies, or as servants of the Royal Niger Company, on the upper waters of the river Niger.

The claim of these fifteen million people upon our attention and sympathy has been largely increased by the latest international rearrangement of the map of Africa, whereby the whole of the Hausa States have been placed under the protection of Great Britain, for whose civilisation and wellbeing we have thus accepted the moral responsibility.

The Hon. Secretary of the Hausa Association, Rev. J. O. Murray, Emmanuel College, Cambridge, will be pleased to send to any member of the Royal Scottish Geographical Society further particulars in regard to the work of the Association, or to receive any contributions towards the same.

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

The Annual Business Meeting was held in the Society's Hall, Edinburgh, on Thursday afternoon, 16th November, at 4 o'clock. Dr. Cleghorn presided.

The following resolutions were adopted :—

1. On the motion of Dr. George Smith, seconded by Mr. John Gunn, "That His Grace the Duke of Argyll be re-elected President for the current Session ; that the Vice-Presidents of the Society be re-elected ; and that Lord Overtoun be elected a Vice-President."
2. On the motion of Professor Knott, seconded by Dr. George Smith, "That the Honorary Office-bearers of the Society be re-elected."
3. On the motion of Mr. J. G. Bartholomew, seconded by Mr. Ayling, "(*a*) That the following 12 Members of Council retiring by rotation be re-elected :—Captain Clayhills Henderson, R.N., Mr. R. A. Robertson, Mr. Wm. Jolly, Dr. Geo. A. Turner, Mr. J. R. Mackenzie, Dr. John Kerr, Mr. J. B. Sutherland, Dr. George Smith, Dr. Jas. Burgess, Major-General Sir R. M. Smith, Mr. J. W. M'Crindle, and Mr. W. B. Blaikie ; and (*b*) that in room of the eight other Members retiring in rotation, the following gentlemen be requested to serve on the Council :—Sir Alexander Christison, Professor Butcher, John Geddie, Lieutenant-General Cockburn, J. Arthur Thomson, G. L. Crole, Robert S. Allan, and F. L. W. Garrioch."

The Secretary submitted the Annual Report of Council, which, on the motion of the Chairman, was adopted.

The Anniversary Meeting of the Society was held on Friday evening, the 17th November, in the U.P. Synod Hall, Edinburgh, when the Marquess of Lothian presided. General Lord Roberts, who was very cordially received, delivered an address on "India, Past and Present," which forms the first article in this number of the *Magazine*. General Sir R. Murdoch Smith proposed, and Principal Sir William Muir seconded, a vote of thanks to the lecturer. The Chairman then presented the Society's Diploma of Honorary Fellowship to Lord Roberts. A vote of thanks to the Chairman was proposed by Mr. Lewis M'Iver.

The Glasgow Branch held its Inaugural Meeting on Monday, November 20th, in the Athenæum Hall, when Lord Roberts repeated his address. The Chair was taken by Sir W. Renny Watson, and a vote of thanks was awarded to the lecturer on the motion of Lord Provost Bell.

The Dundee Branch held its Anniversary Meeting on Wednesday, 22nd November, in the Gilfillan Hall, the Chair being taken by the Earl of Camperdown. Lord Roberts addressed the Meeting, and was awarded a vote of thanks on the motion of Captain Clayhills Henderson, R.N.

The Aberdeen Branch met in the Queen's Rooms on Friday, 17th November. Lord Provost Stewart presided, and Mr. Alexander Hosie, of H.M.'s Consular Service, delivered an address on the Island of Formosa. At the conclusion Mr. Ferguson of Kinmundy proposed and Professor Pirie seconded a vote of thanks to the lecturer.

The Anniversary Dinner took place on Saturday, 18th November, when 130

Members and their friends met at the Waterloo Rooms. Lord Balfour of Burleigh presided, and was supported by Professor Geikie and Dr. Murray, Vice-Presidents of the Society, and the Hon. Secretaries and Treasurer. Among the guests were Lord Roberts, Lieutenant-General Lyon Fremantle, C.B., Brigadier-General Macdonald, C.B., Colonel Boughey, A.A.G., Colonel Hobart, commanding the Royal Artillery in Scotland, and Colonel Beck, 12th Lancers.

GEOGRAPHICAL NOTES.

By W. A. Taylor, M.A., F.R.S.E.,

Librarian, R.S.G.S.

EUROPE.

The Direction of the Wind over the British Isles.—Mr. F. Campbell Bayard read a paper with this title before the Royal Meteorological Society, on April 19th (*Quarterly Journal*, July). The charts he exhibited were five in number, being one for each of the months of January, April, July, and October, and one for the year, and were compiled from observations extending from 1876 to 1880. Referring to the last of these, Mr. Bayard remarked that the percentages of the different winds at Valencia, with the exception of the east and north-east winds, are tolerably uniform, but that as we pass round the south coast and into the Irish Channel the west and south-west winds increase in frequency. Farther north the south and south-east winds show larger percentages, but along the west coast of Scotland the latter gradually disappears as higher latitudes are reached, the south-south-west and west winds coming into prominence. On the south and south-east coasts of England and the east coast of Scotland a very similar variation, with few exceptions, takes place. In Scotland, northerly winds are, on the whole, more prevalent than in England, Wales, or Ireland, and their percentage is greater on the coast than at inland stations. Easterly winds have a moderate percentage throughout the British Isles, while the percentage of westerly winds is the largest, though it does not much exceed that of the easterly winds, except at a few favoured places.

The Sonnblick Observatory.—In the *American Meteor. Journal*, No. 5, the first *Annual Report of the Sonnblick Verein* is noticed. The building of the Observatory was due to the efforts of Herr Ignaz Rojacher and Dr. Hann, and the funds were provided by the Austrian Alpine Club and the Meteorological Society. The Observatory was opened in September 1886.

The *Report* contains complete and systematic data for almost seven years. The mean temperature of February (8½° F.), the coldest month on the Sonnblick, is the same as is experienced in North-Eastern Russia and Central Canada in January. The mean July (34½°) and August (34·7°) temperatures correspond to the greatest degree of summer cold in the circumpolar regions, namely, that of Franz Josef Land. The mean annual temperature of the Sonnblick (20·7°) is found in the southern part of Spitzbergen, the central part of Siberia, and around Hudson's Bay. The lowest temperatures at the Observatory occur with northerly winds and barometric depressions. As regards humidity and cloudiness, the conditions prevailing at low-level stations are reversed on the Sonnblick, the relative humidity being here least in winter and greatest in summer, and the sunniest month being February, while May is the most cloudy. The most prevalent winds are the south-west and north. The highest velocities registered were 80·5 miles per hour, on

January 14th, 1888, and 76·1 miles per hour, on March 18th, 1889. The mean barometric pressure is 20·457 in. The pressure is highest in summer and lowest in winter. The maximum recorded was 21·075 in., and the minimum 19·588 in. From previous studies of the Sonnblick records, Dr. Hann has shown that cyclones at that station have a cold-air mass and anticyclones a warm-air mass, and therefore he believes that they are occasioned by dynamic causes arising from the general circulation of the atmosphere, and not by thermic causes, as has been generally supposed.

The Protection of St. Petersburg from Floods.—In the *Zapiski* of the Russian Geographical Society, vol. xxv. No. 2, Monsieur E. I. Tillo discusses the numerous projects hitherto set forth to protect the city from the waters of the Neva, which periodically cover considerable areas, much to the detriment of the health and property of the inhabitants. These floods seem to be chiefly, if not entirely, due to westerly winds, which blow up the Gulf of Finland and drive back the water in the channels of the Neva. M. Tillo classifies the projects under six classes. The most ambitious scheme is that of Major-General Bazen, who proposed to carry a dam from the Lissii Noss across the Gulf to the island of Kotlin and on to Oranienbaum, thus including the fortress of Kronstadt. Sluices would allow the waters of the Neva to flow out into the Gulf, and the passage of vessels would be provided for by gates. It is to be feared, however, that great expense would be incurred in finding a firm foundation for the dams; that vessels would be exposed to great danger from stormy winds while waiting for such a state of the tide as would allow them to pass within the dam; and that much inconvenience might be caused by alterations in the navigable channels, owing to the silting-up which would naturally ensue. General Bazen afterwards modified his scheme by replacing the sluices by an open waterway, nearly 190 yards wide, between two overlapping dams on the Oranienbaum side of Kotlin; but it is doubtful whether the velocity of the stream in such a canal would be compatible with the safety of the foundations of the dams; and were the channel widened, its efficacy would be much diminished. Some engineers, as Colonel Treter, have proposed to surround the city with a dam, and others, as M. Vibeking, to canalise the mouths of the river. The most feasible project, however, seems to be that of V. P. Petroff, translator and reader to the Empress Catherine II., who in 1825 published a scheme for the embankment of individual parts of the city, giving instructions how to exclude the water from the drains by valves, and prevent it penetrating into the city through the approaches to the river in the embankments. The cost of this undertaking would probably be much less than that of any of those already mentioned, and might be spread over a large number of years, those quarters of the city which are most subject to inundation being protected first. Moreover, during the construction of some of the embankments experience might be gained by which the system might be improved.

From observations extending over 300 years, it appears that in that period the waters of the Neva have fifteen times risen more than 7 feet above their ordinary level; in 1824 they rose to 14 feet, in 1777 to 10 feet, and in August 1890 to 9 feet. On the whole, floods seem to recur at longer intervals and to diminish in height and extent. Consequently, M. Tillo takes a height of 9 feet above the ordinary level as the limit to which protection must be extended. At the instance of General Tillo a plan was drawn up showing the parts of the city that were inundated in 1890, on which it is seen that these consist of twenty-five different areas entirely isolated from one another. M. Tillo then proceeded, with the assistance of General Mazuroff, who has had much experience in works of a similar character, to estimate the cost of the necessary constructions, namely, the raising

of existing stone embankments a height of two to four feet, the erection of new wooden embankments, and adding superstructures to the old. The results of his calculations showed that to extend the operations over all the areas needing protection about 4½ million rubles (about £450,000) would be required, while to protect those which suffer most, and are situated in five quarters of the city, 2½ millions (about £250,000) would suffice. Even the latter is a large sum, but trifling compared to what the other schemes would entail. More than 21,000 persons would be benefited in the five quarters alluded to, and the work might be completed in detachments, so as to spread the cost over a number of years, while immediate protection would be afforded to each part as soon as the embankments were completed, whereas the other plans must be carried out in their entirety before any advantage could be derived from them.

The question of the relation of the level of the subsoil water in St. Petersburg to the level of the Neva has not been thoroughly investigated. Some authorities have maintained that there is no connection between them, but that the variations in the level of the subsoil water are controlled by atmospheric pressure alone. However this may be, it seems from observations of General Tillo that the rise and fall of the subsoil water is small compared to that of the river. Any danger that may arise of seepage from the river during high-water may be obviated by puddling in clay behind the embankments.

ASIA.

The Pamirs.—An article in the *Geographical Journal* for November, written by the Earl of Dunmore, contains an account of the journey he made in the spring of this year. Leaving Leh, accompanied by Major Roche, he crossed the Shyok river, passed through the Nubra valley, and by the Tutialak river and the Great Sassir glacier reached the Depsang plateau, coming on to it unexpectedly at the summit of a pass 18,330 feet high, which he named the Peyma-laptse (the Tibetan for butterfly), after a beautiful butterfly seen on the summit. This plateau, a burning desert of sand and shingle absolutely devoid of snow in spite of its great elevation, extends about 36 miles from north to south, and is probably 40 miles from east to west. After a descent to the Chip-chak and Karakorum rivers, the travellers crossed the Karakorum pass, the height of which was given by two aneroids at 18,880 and 19,000 feet respectively. A boiling-point observation taken by Prince Galitzin gave 19,050 feet. Descending along the Yarkand river and crossing the Suget pass, 18,680 feet, the party reached the Chinese fort. Being unable to obtain the provisions they had expected, they were obliged to turn their steps towards Yarkand, and, the Kilian pass being impracticable owing to the snow, they rode up the Karakash river and crossed the Grim pass, 17,330 feet, a razor-backed ledge with a precipitous descent on the further side. Arriving at the Sanju river, Lord Dunmore followed its course for two days, and then turned up a tributary called the Arpalek, which he left about a mile from its confluence, and proceeded in a north-easterly direction to the Chuchu Mountains, which he crossed the same evening at a height of 12,500 feet. Thence across an uninteresting country the expedition marched to Sanju and Yarkand. Like Kashgar, Yarkand consists of two cities, the old and the new, the former being simply a large fort inhabited by 2000 persons, while the latter, with the suburbs, has a population of 60,000.

The onward route ran across the desert of Shaitan Kum, and over the Kara Davan to the Kiaz river, which was followed to its junction with the Charlung, and then by Chehil Gumbaz and the Tarut pass, 13,600 feet high, to the Toilobolong

river. Along the wild and almost impassable ravine which bears the same name Lord Dunmore ascended to a plateau of coarse grass and granite boulders, at an elevation of 13,800 feet, and saw before him the Sarikol mountains, the eastern barrier of the Pamirs. After leaving this plateau, the route again ascended to the lake out of which the Yambulak river flows. It is surrounded on three sides by stupendous cliffs rising precipitously from the water's edge to a height of 2000 feet, and lies 15,800 feet above sea-level, while the pass beyond is 16,530 feet high. The sides of the pass were deeply covered with snow, and the temperature sank 91° below that of the plain. The march to Tashkurgan, which was reached in two days, was exceedingly trying. Tashkurgan is a small village, the capital of the Sarikol district, and has a Chinese fort on a piece of rising ground on the left bank of the Taghdumbash river. The inhabitants of the district, 6000 in number, are Mohammedans of the Shia sect, and speak the same language as the Shughnanis. Establishing a permanent camp on the Kukturuk river, the party made several exploring excursions, and ascertained that the Kilik pass is a shorter route to Hunza and Gilgit than the Mintaka, which is generally used. Lord Dunmore also crossed the Beik pass, 16,370 feet, and confirmed a report that the Chinese had been turned out of Ak-tash by the Russians, the fort being totally demolished. Over the Wakjir pass, 16,680 feet, and down the Ak-bilis river the party marched to Bozai Gumbaz, where Captain Younghusband was stopped by the Russians in 1891, and proceeded eastwards to the Chakmak-kul, out of which flows the Ak-su. This river Lord Dunmore holds to be the true source of the Oxus : it rises on the north-east side of the watershed which separates it from the source of the Sarhad river, and has a course twelve miles longer and a larger volume of water than the latter stream. The Great Pamir was reached by the Andamin pass, 15,150 feet, and the intention was to make for Wood's, now Victoria, lake, but, being led astray by the guide, the expedition arrived on November 4th at the Chistoba river, far away to the north-east. With the aid of the compass the travellers worked their way back, and, crossing a small pass, 15,130 feet high, which they named the Fox pass, came to one of the small lakes lying to the east of Victoria lake, which they sighted next morning. Skirting the northern shore of the lake and riding eight miles down the Pamir river, they discovered a pass 15,700 feet high, which they named the Hauz Davan, or Reservoir pass, from a frozen lake on the summit of rectangular form surrounded by flat stones. This led them to a large basin containing four lakes : the Sasik-kul, 3 miles long by one broad ; the Tuz-kul ; and two smaller ones, the last being the Khargosh-kul at the foot of the pass of the same name. The altitude of the lakes was 13,400 feet, and the whole surrounding basin was encrusted with saltpetre. The next pass was named Guljia-kul, from the numerous horns and skulls of *Ovis poli* lying about. Then Bulun-kul, 13,000 feet, was reached, and Surmatash. Bulun-kul is connected by a river with Yashil-kul, the largest lake in the Pamirs after Kara-kul, being 16 miles long. For five days the travellers followed the Alichur river, and crossed the Nezatash pass, 14,430 feet, to Murghabi, Colonel Yonoff's quarters, where they were hospitably entertained by the Russian officers. Then, passing Ak-baital and riding by the shore of the Chor-kul, which is 6 or 7 miles long, they came to Rang-kul, which is separated from the former lake by a quarter of a mile of land, and is not connected with it by any water-channel. Here the thermometer fell to −25° in the night, and all the party agreed that Rang-kul was the coldest place on the Pamirs. The Russian fort stands at an elevation of 13,500 feet above the sea-level, on the edge of an immense plain. From the Kokbeless pass, 15,300 feet, a splendid view of the Mustagh-ata was obtained, and then the route ran on to the foot of the Ak-berdi mountain, and across the Chinese frontier to Bulun-kul.

The Gez defile was then entered, and a very rough journey brought the travellers to Kashgar.

Here Lord Dunmore and Major Roche were obliged to part, the latter having no Russian passport, and being, therefore, obliged to return to India. Lord Dunmore proceeded by the Kan-su pass, the head waters of the Kizil-su, and the Russian fort of Irkishtan, to the Alai mountains, where he crossed three passes, the Kok-bel, 11,950 feet, the Ek-zek, 11,600 feet, and the Bor-ak, 11,550 feet, all very difficult owing to the ice which covered them. On Christmas Eve the temperature fell to – 38°, and in the morning three horses were found frozen to death. After passing the Terek Davan, 14,000 feet high, the worst pass in the Alai range, no further difficulty was experienced, and Lord Dunmore arrived at Osh in Ferghana, where he was welcomed by Colonel Grombchevsky.

AFRICA.

Mount Kenia.—A letter from Mr. Gregory, of the British Museum, has been published in the *Geographical Journal*, vol. ii. No. 4, containing one or two geographical details. The Aberdare mountains, which, from the descriptions of Mr. Thomson and Lieutenant von Höhnel, Mr. Gregory expected to find a double range separated by the Ururi valley, he ascertained to be a volcanic mass piled up near the edge of the Leikipia plateau, the Ururi and the Nyiri being the same river. He ascended Mount Kenia to a height of 3000 feet above Teleki's highest point, and estimated the total height of the mountain at about 19,000 feet; Höhnel's aneroids must, he thinks, have gone wrong. Nor is the description given of the peak by Teleki quite accurate. Instead of being part of the wall of a vast crater full of snow, it is the central core of a greatly denuded old volcano, of which the crater has long disappeared. On his return from Kikuyu, Mr. Gregory followed up the Thika-thika, and found that several rivers from the Athi plains really enter the Tana, while the mapping of the most westerly head-streams of this river requires much revision.

British Central Africa.—Mr. H. Crawford Angus, in a letter kindly forwarded to us by his friends, speaks of the Tochila plain, which extends from Mount Zomba and the Shirwa lake down to the Ruo, and from Mount Milanji to the three hills on the west, called Choda, Midima, and Mombala. It is watered by the rivers Tochila and Likagula, affluents of the Ruo. During the rainy season it is generally covered with water, while in the dry the ground becomes as hard as brick and, where not sheltered by trees, perfectly bare. The vegetation in the wet season consists of tall grass and forests of stunted trees, with numerous climbing plants. The game consists of hartebeest, eland, sable antelope, zebra, and waterbuck, besides smaller animals. Hippos and rhinoceros are also to be found. The plain was formerly thickly populated by Chinganja, and now that the Angoni raids have been stopped the people are again descending to the plains from the hills. The British Commissioner is also opening up the country by roads, one of which, from Blantyre to Mount Milanji, forty miles long, Mr. Angus has been engaged in constructing.

The Livingstone Mountains.—On January 29th Dr. Bumiller left the new station, Langenburg, to visit this range, which lies to the north-east of Lake Nyassa, and has never been thoroughly explored. It is composed of a number of parallel chains, running from south to north and gradually rising to a higher elevation, with but few prominent peaks. On the west the spurs sink rapidly to the lake. The country near the lake is full of ravines and clefts, precipitous cliffs and violent torrents, and contains as romantic scenery as any to be found in Switzerland or

Tyrol. The central highlands are gently undulating and almost deprived of trees, grass and heath being the principal forms of vegetation. The elevation is 8000 to 10,000 feet. The highest summit, at any rate in the northern and middle parts of the range, is the Dumve, 10,000 feet high, but it is surpassed by the Beya, which, at about 9° S. lat., adjoins the Livingstone range. The Dumve forms the watershed between the Nyassa and the Indian Ocean. To the east of it lies the drainage basin of the Rufiji. The flora approaches more and more closely to the European type as higher elevations are reached. There is hardly any game. The inhabitants are the Wakinga, who build their conical huts up to a height of 6500 feet. They are at a very low stage of culture, are poor, shy, and cowardly, and hold no communication with the Waketi on the lake.—*Globus*, Bd. lxiv., No. 10.

The French Congo.—It is proposed to construct a railway from Loango to Brazzaville, and Monsieur A. Le Châtelier has been authorised to make the necessary surveys. If it be found expedient, the river Niari-Kwilu may be used as a means of communication along a part of the course. From the bar at the mouth up to Kakamoeka, a distance of 47 miles, the Kwilu is navigable for vessels drawing less than 10 feet of water. Then rapids obstruct the bed at intervals up to Zile-Ngoma, while above this point the only obstacles are banks of gravel and a few rocks, which even at low water leave a free passage up to the confluence of the Likoni, 60 miles from Brazzaville. This section of 185 miles is navigable during the six months in the year when the water is high. Should it be found impracticable to utilise the lower course of the river with the aid of locks, at any rate the waterway of 125 miles from Ludima to the Likoni will be available. As a starting-point there is a choice of the bay of Loango or that of Pointe Noir. The chief difficulties in the construction will occur on the eastern side of the forest of Mayombe, where the altitudes exceed 2300 feet; but on the whole the ground seems to be favourable for the undertaking. The distance from Loango to Brazzaville is 280 miles as the crow flies, and the railway will probably be 310 miles in length. It is anticipated that the cost will amount to £800,000 if river navigation be resorted to, while for a railway along the whole distance it will reach £2,000,000.—*Revue Fr. et Exploration*, Oct. 15.

AMERICA.

Colombia.—Monsieur de Brettes' explorations, which were noticed on p. 210, have been continued during the present year. His most important work has been carried out on the western slope of the Sierra Nevada. From the Rio Hacha he passed through Dibulla, and marched through forests to the source of the Rio Palomino, where he stopped at the village of Hucumey, 3980 feet above the sea. Thence by the eastern bank of the Palomino, and touching the river Mañiy, M. de Brettes reached the Gueca mountain, where he camped at an altitude of 9500 feet, and descended into the valley of the Uluey or San Diego. This stream he ascended to its source, 15,340 feet, called Ulueysaa, and then crossed the Nunucuamala mountains, amongst which the Guecasancala rises to a height of 18,400 feet. By Nunuanlaclak, Evieclak, and Aca Arlughinca he reached the Rio Frio, called by the natives Nizah. Besides the animal and mineral richness of the country, M. de Brettes noticed in several places the presence of copper and iron, and discovered one gold-mine and thirty-four deposits of coal. Between Hucumey and the Rio Frio, immediately to the north of the eleventh parallel of latitude, and between 73° 55′ and 74° 5′ S. long., lie five lakes, of which the largest has an area of forty to fifty acres. The water of these lakes, though pure as crystal, appears perfectly black, owing no doubt to its great depth. The *Boll. della Soc. Geogr. Italiana*, June-July, gives a list of thirty-six tributaries of the rivers above

mentioned, and eighty positions determined astronomically by M. de Brettes in the valley of the Magdalena and the adjacent districts.

The North-west of Argentina.—In January of the present year Dr. Francisco Moreno, Director of the La Plata Museum, took the command of an expedition to the north-western districts of the Republic, which was equipped by the Government for archæological and geological investigations, and, more particularly, to solve geographical questions connected with the much discussed question of the boundary between Chile and Argentina. This expedition, which was joined by Dr. Ten Kate, extended its labours from the town of Catamarca in the south to latitude 22° 30′ S., among mountain ranges 4000 to 10,000 feet high. Dr. Ten Kate devoted his attention principally to archæology, and at Arenal, San José, Santa Maria, Fuerte Quemado, Tolombon, and La Paya, near Cachi, collected a large number of antiquities. Most of these were pottery of very varied forms and richly ornamented. There were also found weapons, tools, and ornaments of stone, bells of copper, and arrow-heads of bone and shell. Skeletons, many of them buried in earthen jars, were unearthed. The inland peoples, now vanished, possessed mines and knew how to smelt metals; they were acquainted with the arts of weaving and agriculture, and owned large herds, at first of lamas and later on of sheep and goats. Besides towns all built of heavy stones, rough or hewn, and of *algarrobo* wood (*Prosopis sp.*), the Calchaquis had a number of forts erected on mountain summits difficult of access.

The natural features of these districts reminded Dr. Ten Kate of Arizona and New Mexico, and the dreary wastes presented a strong contrast to the green islands of the Malay Archipelago and the South Pacific, which the traveller had recently left. Most of the country is poor in everything, except where in a few spots grapes and peaches are abundant. Evidently the soil was formerly much better watered, and therefore more fertile. The north-west provinces, at any rate among the mountains, seem to be drying up; every year the land becomes less fitted for habitation. The population emigrates in increasing numbers to seek further eastwards for the means of subsistence denied them by their native land. Since the Spaniards annihilated the numerous and heroic Calchaquis and Quilmes, the country has constantly retrograded. Of settlements once thickly peopled, only a few ruins remain; and where fruitful fields of maize once waved, nothing grows but huge cactuses. A thin population of poverty-stricken half-castes and Indians, lazy, ignorant, and supine, has taken the place of the old race with its peculiar civilisation. The Quechua tongue has been driven out by Spanish.

The topography and cartography of this country are as yet in their infancy. The map of Brackebusch, which is considered one of the best, is full of inaccuracies and serious errors. The map of the province of Catamarca, by G. Lange, one of the members of the expedition, which has cost four years of work and is now nearly completed, will throw much light on the topography of the country.—*Tijdschrift van het K. Nederl. Aardrijkskundig Genoot.*, Deel x. No. 4.

GENERAL.

Exploration of the Upper Atmosphere.—In March last two French scientists, MM. Hermite and Besançon, ascended from Vaugirard at 12.25 p.m., and rose to a height where the depression of the mercury amounted to 4·06 inches, indicating an altitude according to Laplace's formula of 52,480 feet, corrections for differences of gravity and temperature being neglected. At 41,000 feet the thermometer marked the minimum temperature of −60° F., or a decrease of 122½°, the temperature on the ground being 62½° F. The average fall was, therefore, one degree for every

335 feet. At 52,480 feet, or, rather, at the barometric pressure of 4·06 in., the thermometer rose to $-6°$, probably owing to the heating effect of solar radiation on the basket containing the instruments. The records seem to indicate a considerable increase in the intensity of solar radiation in the higher regions, while the air temperature falls more and more rapidly in higher strata. At the altitude to which the balloon rose the density of the air must be less than that of the lunar plains, if it be granted that the density on heavenly bodies is proportional to the gravity at the surface, and therefore the observations made are of importance with regard to temperature and radiation. The balloon remained floating for several hours at this enormous altitude, whence it may be inferred that, where the atmosphere is so rarefied and no trace of vapour remains, the heat does not vary sensibly with the altitude of the sun. But when the sun is approaching the horizon, about six o'clock, the thermometer begins to fall rapidly.—*Ciel et Terre*, May 16.

Heights and Velocities of Clouds.—During the last five years observations on the height and motion of clouds have been made at the Blue Hill Observatory, Mass., U.S., by Messrs. Clayton and Fergusson. One of the most noticeable results is that the same form of cloud is lower in winter than in summer. The difference in height is greatest in the highest, and gradually diminishes down to the lowest, clouds. From altitudes measured at Upsala, Kew, and Blue Hill, it appears that the upper limit of ordinary clouds in temperate latitudes is about 9 miles, but more numerous observations might extend it to ten miles. The mean velocities recorded at Blue Hill show that the entire atmosphere in the cloud-bearing strata moves twice as fast in winter as in summer. The mean velocity of the highest clouds is over 110 miles per hour, while the highest velocity observed was as much as 230 miles per hour.—*Quarterly Journal of the Royal Meteor. Soc.*, April.

Heights and Lengths of Waves.—In the *Festschrift*, compiled in honour of Baron von Richthofen's sixtieth birthday, is an article by Dr. G. Schott on the dimensions of waves observed by him in 1891 and 1892 on board the sailing vessels *Robert Rickmer* and *Peter Rickmer* during a voyage round the Cape of Good Hope. Only waves in the open sea over deep water are discussed, and not those which, near land, are affected by the configuration of the bottom. Each series of observations was taken on the same day, so that the means obtained are for a constant velocity of wind. For the measurement of the heights of waves, Dr. Schott was provided by the Deutsche Seewarte with a delicate aneroid, from which the pressure might be read off to the second decimal. The heights were also estimated by the eye. One cause of error affecting even aneroid observations is that a vessel lies deeper in the water when passing the crest of a wave than it does in the trough. The Hon. Ralph Abercromby assumed a constant difference of 6 feet, but Dr. Schott, considering that the difference depends partly on the vessel—whether it is laden or in ballast, long or short—added various corrections, obtained by observation of the water at the side of the vessel in which he happened to be sailing, the largest being under 6 feet.

With a fairly strong trade-wind it was found that the periodic time of the waves was 4·8 seconds, the length of the wave 115 feet, and the velocity 24·6 feet per second, equivalent to 16·8 English, or 14·6 nautical, miles per hour. This is about the speed of modern sailing vessels. As the wind rises the waves attain much larger dimensions and velocities. With a stiff breeze (Beaufort sc. No. 7) their length extends to 260 feet, and their velocity attains 360 to 364 feet per second. Waves with a period of 9 seconds, a length of 400 to 425 feet, and a velocity of 28 nautical miles per hour, occur only during storms, and may be taken as the average sea caused by a

wind of strength 9. On one occasion, during a storm from the south-east, in the South Atlantic, Dr. Schott measured waves 690 feet in length; and even this was not the maximum, for in lat. 28° S. and long. 39° E. he experienced a swell with waves having a period of 15 seconds, a length of 1150 feet and a velocity of 78·7 feet per second, or about 46½ nautical miles per hour.

As regards the height of waves, Dr. Schott is inclined to assign a comparatively low figure as the maximum limit. Former observers have given estimates lying between 30 and 40 feet, or a little more, for a wind force of 11 on the Beaufort scale, and Dr. Schott's maximum was only just over 32 feet. He considers, therefore, that in a perfect hurricane waves higher than 60 feet can hardly occur, and that 50 feet must be a very exceptional height. In an ordinary trade-wind the height is about 5 to 6½ feet. The ratio of the height to the length is about 1·33 in a moderate wind, 1·18 in a strong wind, and 1·17 in a storm, whence it follows that the inclinations of the slopes of the waves are about 6°, 10°, and 11° respectively. The ratio of the height of waves to the wind strength varies considerably, becoming much larger with strong winds and storms.

MISCELLANEOUS.

Herr J. **Büttikofer**, the well-known explorer of Liberia, started in September for Borneo, where he intends to make a scientific expedition, ascending the Kapuas up to the watershed.—*Globus*, Bd. lxiv. No. 16.

It is reported from San Francisco that the whaler *Newport*, which passed the winter 1892-3 at Herschel Island, to the west of the mouth of the Mackenzie river, has advanced as far northwards as 84°, or 36′ nearer the **North Pole** than Lieutenant Lockwood, of the Greely expedition.—*Globus*, Bd. lxiv. No. 18.

The *Annals of Scottish Natural History* for October contains Notes on the Disappearance of the Short-Tailed Field Vole, by Peter Adair; a paper on the Discovery of *Cephalaspis* in the Caithness flags; and several other interesting articles. The Zoological and Botanical Notes are numerous and varied in their contents.

Lord Dalrymple has settled the question of the origin of the name **Omoa** (see p. 601) by writing that Colonel (then Captain) William Dalrymple commanded the military force at the capture of the Honduras fort. The particulars were published in the *Scots Magazine*, vol. xliv. p. 235. One of the family recently lent a plan, illustrating the attack, to the Military Exhibition on the Mound.

The Russian Government has under consideration a project of forming a marine arsenal on the Murman coast at **Port Vladimir** in Lapland, 700 miles from St. Petersburg. The line connecting it with the capital will pass through Joensun at the north-east of Lake Ladoga and Kem on the White Sea. Besides its strategic use, the railway will serve to transport the fish caught off the coasts of Lapland, for the port is always free of ice.—*Revue Fr. et Exploration*, Sept. 1st.

In the *Imperial and Asiatic Quarterly Review*, Oct. 1893, Mr. A. Silva White discusses the present position of the **British Confederation** question. He considers that the colonies are not yet sufficiently developed to form a customs union, but that, as a first step towards more intimate connection, a defensive union of the British Empire might be established. In this matter the Imperial Institute is the right body, in Mr. White's opinion, to take the initiative, having been founded for the express purpose of drawing closer the ties connecting the different parts of the Empire.

Captain **Roborovsky** set out last summer from the town of Przhevalsky on a long expedition which is to extend over not less than three years. He will investigate the Lukshin Kyr depression (see vol. vii. p. 378). Then, after crossing the Gobi

desert from the Lob Nor to the Kuku Nor, he will explore the basin of the Yang-tse-kiang in the province of Sze-Chuen. On his return he will pass through Dzungaria. Surveys will be made by the expedition, positions astronomically determined, meteorological observations taken, and observations on the fauna and flora and ethnographical notes recorded. The Ministry of War, the Topographical Section of the General Staff, and the Russian Geographical Society have combined to furnish the expedition with a full equipment.—*Bol. della Soc. Geogr. Italiana*, June-July, 1893.

General Derrécagaix has presented to the Paris Geographical Society a partial photographic reproduction of the **Flatöbog**. This book was written in Iceland, between 1380 and 1390, by two priests, Ion Pordarson and Magnus Porhallson. In the seventeenth century it fell into the hands of John Finsson of Flatey, in the Breidarfirth, and in 1662 was carried to Denmark and deposited in the Royal Library at Copenhagen, where it has remained ever since. It was to have been exhibited in the Chicago Exhibition, but public opinion in Denmark was so strongly opposed to its transport, though every precaution was to have been taken to ensure its safety, that a reproduction of that part of the manuscript relating to the voyages of Leif Erikson to America was sent instead. In this part Greenland is first spoken of, and then the voyages of certain navigators, which, it seems, were frequent, to a country lying more to the south and west.

Mr. Robert Stein, of the U.S. Geological Survey, has proposed a scheme for the systematic exploration of the **Arctic regions**. He would establish a permanent basis of operations in regular communication with the civilised world and close to the unexplored region. Such a point is the south-eastern extremity of Ellesmere Land at the entrance of Jones Sound. With this as centre, secondary stations will be formed—at first not more than a hundred miles apart. Thus a network will gradually be spread over the land enabling any one to traverse the Arctic regions with a minimum of risk. It is quite possible that the discovery of the North Pole may be the ultimate outcome of the scheme, though it is not its immediate object. Having placed the undertaking under the auspices of some scientific body, the promoter proposes to appeal to all the scientific societies of the world to contribute the £2000 necessary to give the project a favourable start. The preliminary voyage is to be made in 1894.

The attention of members is called to the Society's **Atlas of Scotland**, for which subscriptions are now invited. The topographical map in forty-five sections is a reduction from the Ordnance Survey, on the scale of half an inch to a mile, and will be revised to show the new county and parish boundaries as determined by the recent commission, and will be further brought up to date by the insertion of new roads, hamlets, etc., which do not appear on the Survey maps, and the deletion of those which have ceased to exist. In addition to the above, the atlas will contain a series of plans of towns and a set of valuable maps dealing with the Physiography, Geology, Meteorology, and Natural History of Scotland, edited by Mr. J. A. Harvie-Brown, Sir Archibald Geikie, Professor James Geikie, and Dr. Buchan respectively. By arrangement with Mr. J. G. Bartholomew, who has designed and prepared the atlas, and is more especially responsible for the topographical work, the Society is able to offer this unique cartographical production to its own members, and to those of the Royal Geographical Society, on very advantageous terms. Subscribers desirous of availing themselves of this offer must send in their names to the Secretary before December 15th.

Her Majesty the Queen has graciously accepted the dedication of this volume.

We regret to have to announce the death of **Mr. A. L. Bruce**, Hon. Treasurer of the Society, and one of its founders. An obituary notice will appear in the January number.

NEW BOOKS.

British East Africa or Ibea : A History of the Formation and Work of the Imperial British East Africa Company. By P. L. M'Dermott, Assistant Secretary With Map and Frontispiece. London : Chapman and Hall, 1893. Pp. 382.

This volume is not literature, but is of the authoritative Blue-book order. Hence its value, alike as a record of the circumstances which led to the formation of the Ibea British East Africa Company, of its constitution and character, and as a vindication of its aims and ends. What would we not give now for a similarly clear and full collection of the documents connected with the foundation of the greatest of all the Chartered Companies—the East India Company, founded by Queen Elizabeth? Peculiar value is given to this book by a fine portrait of Sir William Mackinnon, Bart., at whose express desire its compilation was undertaken. What the German Imperial Government has done for its extensive possessions in East Central Africa, this Chartered Company has accomplished single-handed, saving for Great Britain the island and northern coast-line of the Sultanate of Zanzibar, which Anglo-Indian statesmanship had developed, British Indian subjects had commercially worked, and British philanthropy had, in the first instance, begun to deliver from the slave-trade. It will be difficult, henceforth, for the impartial student, with this volume, and especially its fourteen appendices of official documents, in his hands, to come to any other conclusion than this, that Sir William Mackinnon and his Company have done magnificent service to the Empire as well as to humanity, and that, especially in the matter of Uganda, it has been grievously misrepresented and wrongously dealt with. The outcome of the Uganda question, politically, we have yet to learn, but, whatever it may be, Scotland at least cannot but be proud of, and grateful to, such sons as the late William Mackinnon and the happily still living George S. Mackenzie. British Zanzibar has a great future before it, if our imperial duty to Uganda, the Sudan, and the Nile valley is cautiously discharged, irrespective of political rivalries and the interference of the Romanist missionaries who represent France.

The Company should now employ a literary expert to do justice to its history and prospects, and those of the Christian Missions from Zanzibar and Mombasa to Kibwezi and Uganda, in a popular volume well illustrated with pictures and maps. From Krapf and Mackay, Speke and Grant, to Bishops Hannington and Tucker, H. H. Johnston and Joseph Thomson, Lugard and Macdonald, the story is worth telling well.

Travel and Adventure in South-East Africa. By Frederick C. Selous. London : Rowland Ward and Co., 1893. Pp. 477. Illustrations and Map. *Price* 25*s.*

The greater part of this book is occupied, as one might expect, with Mr. Selous' experience as a hunter and pioneer-traveller. But the author is not satisfied with his reputation of being merely a "mighty hunter:" he places his unique experience of South-East Africa at the disposal of the public, and he arrives at many sensible conclusions regarding the political and economical conditions of the countries he knows so well. To him and Mr. Rhodes we owe the prompt and

pacific occupation of Mashonaland. It was Selous who, after first having urged this measure on Mr. Rhodes, planned and superintended the cutting of the pioneer-road, and who himself led the way for the British South Africa Company's forces. The history of this enterprise illustrates the characters of its leaders, and redounds to the credit of both.

For those who are interested in hunting and lion stories, or who are fascinated by the shifts and dangers of pioneer-life in Africa, Mr. Selous provides ample material for study. Our museums have been enriched by his collections, and owe to his gun many rare specimens of the fauna of South-East and Central Africa.

The most interesting chapters to students of geography are, however, those dealing with Mashonaland and Matabeleland. Mr. Selous' estimate of Khama's character and position deserves attention. His description of Mashonaland, though brief, is the best we have seen. His eight years' personal experience of that country is unique, and, happily, this has been placed at the disposal of the Chartered Company. It is noticeable that he speaks of Dr. Jameson, the Administrator, as "*the* man for the position."

Mr. Selous does not believe in the so-called "ruined cities of Mashonaland," and discredits the high state of civilisation which some writers believe formerly existed in South-East Africa. He shows, very conclusively, we think, that wall-building and gold-mining have only recently been abandoned there, and it is upon such evidence that this "higher civilisation" has been chiefly based. In brief, he believes in the gradual fusion of the Arabian immigrants, the worshippers of Baal, with the indigenous populations.

High praise must be accorded to the publisher for the admirable production of Mr. Selous' book. The illustrations are perfect examples of their kind, and have the advantages of artistic and scientific merit; they will be appreciated by both the naturalist and the general reader.

The map is republished by permission of the Royal Geographical Society, and shows very clearly the author's routes; but the spelling does not accord with the text. This is to be regretted, as Mr. Selous makes such a point of following the reformed spelling of place-names advocated by the Royal Geographical Society. Thus, we find such inconsistencies as *Quillimani* and *Kiliman*, *Matabili* and *Matabele*.

The Zambesi Basin and Nyassaland. By Daniel J. Rankin, F.R.S.G.S., M.R.A.S. Edinburgh and London: Blackwood and Sons, 1893. Pp. 274. Maps and Illustrations. *Price* 10*s.* 6*d.*

Mr. Rankin's geographical work in regard to the Loangwa-Zambesi basin, and especially the delta of the Zambesi itself, is sufficiently known to readers of this *Magazine*. His chief claim to distinction as an explorer rests on his survey of the Chindé mouth of the Zambesi. Otherwise, if we except a short flight into the Makanga country, his journeys were over well-known ground, though in a sense he himself was one of the early pioneers into Nyassaland.

For the most part his book is made up of reminiscences, and abounds with unimportant details and anecdotes of pioneer life. It is too scrappy and disconnected to afford a valuable survey of the country as a whole, and too personal and biassed to be regarded as trustworthy. At the same time, the book is readable enough, and is redeemed from the charge of triviality by an attempt here and there to deal with the economical aspects of the several European ventures to colonise South-East Africa. Its chief blemish is the unfair attack which the author makes against Mr. Johnston's administration, the obvious bias of which carries its own condemnation.

The maps are good, as also are some of the illustrations.

Parthia. By GEORGE RAWLINSON, M.A., F.R.G.S., etc. ("Story of the Nations" Series.) London: T. Fisher Unwin, 1893. Pp. xx+432. *Price* 5*s.*

This volume is a reprint, with some alterations, of the work on Parthian history which Professor Rawlinson published some twenty years ago under the title of *The Sixth Great Oriental Monarchy*. In writing that history one of the objects he had in view was to correct the impression which, to use the language of Gibbon, "confounded the Roman monarchy with the globe of the earth." Even in her palmiest days the power of Rome was limited on her eastern frontier by the river Euphrates, and for upwards of two hundred years Parthia divided with her the attention of mankind and the empire of the world. It was thus the destiny of Parthia to sustain for long years a leading part in that great secular feud between the East and the West which has brought them into deadly conflict age after age ever since Greece "launched her thousand ships" to war with Troy. Like other cradles of great empires, Parthia was of but small dimensions. Corresponding nearly to the modern Persian province of Khorasan, it contained an area of not more than 30,000 square miles, and was thus about equal in size to Ireland. It was bounded on the west by Media, on the north by Hyrcania, on the east by Bactria, and on the south by the great Salt Desert of Iran. It has five distinct mountain ranges, which here and there attain an altitude of some 10,000 feet. The valleys between these ranges are in general well wooded, while the upland tracts are rugged and barren. The principal streams are the Tejend and the Nishapur. The former flows past Meshed and the Russian post of Sarakhs, and, having in its course absorbed the Heri-rud, is itself swallowed up in a large swamp. Well watered by these and by smaller streams, Parthia was on the whole a rich and productive country. The climate does not now exhibit such extremes of heat and cold as were ascribed to it by ancient writers. Those parts, however, of the country which lie contiguous to the great southern desert are sometimes terribly scourged by the fiery breath of its deadly simoom.

The origin and early history of the people are lost in the mists of antiquity. Some take them to have been a branch of the Aryan race; but our author, for good reasons assigned, takes them to have been of Scythian origin, and this is now the accepted view. When they first appear in history they were subject to the great Persian Empire; and when this had been subverted by the arms of Alexander the Great, their country became after his death a province of the Syrian kingdom founded by Seleucus. After a subjection of about eighty years to their Greek masters, they struck for independence, and so far succeeded that they placed upon the throne a king of their own, or at least of kindred blood. Our author writes as if they had at this time completely shaken off the Syrian yoke; but there are eminent scholars who think that this result was not achieved till the time of their greatest king, Mithridates I., who, reigning from B.C. 174 to 136, made extensive conquests, and exalted the Parthian name to a high pitch of glory. It is not known how or by whom the revolution was effected. Our author says that in B.C. 250 Arsaces, after whom the Parthian line of kings was called the Arsacid, was raised to the throne, and died after a reign of two years. This is, however, the official, not the genuine tradition, which ignores Arsaces as a Parthian sovereign, and indicates his brother Tiridates as the first who held that dignity. From this period Parthia began to take a notable part in affairs beyond her own borders, and ultimately became mistress of an empire which extended from the Euphrates to the valley of the Indus. The seat of sovereignty was at first Hecatompylus at or near Damaghan, but it was transferred thence to Ctesiphon, which lay on the eastern bank of the Tigris. The Parthian Empire was overthrown in battle in A.D. 224 or 227

by Ardashir, a prince of Persia, who founded the famous Sassanid dynasty of Persia. The history of Parthia has come down to us in dislocated fragments, which are found scattered throughout the works of the classical historians, and Professor Rawlinson, combining the facts disclosed both by these fragments and by the antiquarian researches which in recent times have been so successfully prosecuted in the regions over which Parthia once held sway, has been able to present his readers with a connected view of Parthian affairs from the foundation to the fall of the monarchy. The work fully sustains his reputation as a scholar of wide and exact erudition, and as an historian of standard authority. It is illustrated with maps, drawings, and likenesses of the Parthian kings copied from their coins. The volume is a welcome addition to the "Story of the Nations" series in which it is now included.

The Indian Empire: Its Peoples, History, and Products. By Sir William Wilson Hunter, K.C.S.I., C.I.E., LL.D. Cambridge, M.A. Oxon. New and Revised Edition (the Third). London: W. H. Allen and Co., Limited, 1893. Pp. 852.

This is a new and thoroughly revised edition of a valuable work which has already made its mark, and therefore does not call for lengthened notice. It aims at presenting in compact form an account of India and her peoples, and at giving the essence of the voluminous Statistical Survey of that great empire; and the reception it has already met with shows how successfully this aim has been realised. In its own line it stands without a rival. If it contains in brief compass a varied mass of valuable and accurate information, it is not less notable for the agreeable style in which this information is presented by one who is a master of luminous exposition, and in whose handling the driest subjects are invested with interest. In this new edition the statistical information has been corrected and brought up to date, but at the same time much new matter has been incorporated, giving the results of recent researches in regard to such subjects as the rise of Buddhism, the history of Christianity in India, the revenue of the Mogul emperors, etc., and thus adding to the completeness of the work. We are rather surprised, however, to find that, in the chapter devoted to the rise of Hinduism and the problem of caste, no notice has been taken of Mr. Nesfield's exhaustive and scholarly review of the caste system in the North-Western Provinces and Oudh, which was published by the Government of those provinces in 1885, while frequent reference is made to the painstaking but rather uncritical work of Mr. Sherring. It may be that this is one of those works the views expressed in which, as is stated in the preface, are not set forth, but have been respectfully considered. But even if this be the case, the treatise in question is too important to be ignored altogether, and should at least have been added to the list of authorities. That the views it supports have not been favourably regarded is self-evident, for Sir William still accepts the race-origin or ethnical basis of caste which Mr. Nesfield decidedly, and in the opinion of some decisively, rejects. The question, like many others connected with the early history of India, is involved in much obscurity. The data are few and susceptible of various interpretations, and the conclusions arrived at can often at the best be only probable conjectures. Sir William is well aware of this, and repeatedly cautions his readers; but in spite of these cautions a reader may at times be led by his flowing periods, and the coherent and seemingly satisfactory picture of the development of the existing system, to think the ground on which he is treading to be firmer and more solid than it really is.

The Arctic Problem, and Narrative of the Peary Relief Expedition of the Academy of Natural Sciences of Philadelphia. By Angelo Heilprin, Leader of the Expedition. Philadelphia : Contemporary Publishing Co., 1893. Pp. 165.

A most elegantly got-up and well-illustrated volume containing interesting and valuable papers on "The Arctic Problem," "Polar Expeditions," "The Spitzbergen Route to the Pole," "The Greenland Ice-Cap and its Glaciers," and "The Peary Relief Expedition." The last-named is the special feature of the book, and Professor Heilprin tells the story well. Lieutenant Peary's Expedition was described in a review in this *Magazine* of the work published on the subject (vol. ix. p. 266). Professor Heilprin gives his own account of the Relief Expedition in the volume now under notice. Lieutenant Peary and his companion Astrup had set off alone across the inland ice to the north-eastern shores of Greenland, where they discovered and named Independence Bay (81° 37′). People at home grew anxious about them, and with noble munificence the Academy of Natural Sciences of Philadelphia despatched Professor Angelo Heilprin, President of the Geographical Club of Philadelphia, at the head of an expedition comprising several scientific experts, in July 1892, one year after the departure of Peary from the United States. After some scientific surveying, the *Kite* took up her position at the head of M'Cormick Bay on 5th August 1892, and Professor Heilprin and his comrades landed and commenced crossing the inland ice in the direction Peary and Astrup had taken on 1st May preceding. They attained an elevation of 3300 feet about eight miles from the commencement of the inland ice, and planted a staff displaying directions to the travellers that the *Kite* was in port at M'Cormick Bay. A position for a second staff was selected on an ice-dome about 2½ miles from the first, and just as the party was approaching the ice-dome, "Entrikin's clear vision detected a black speck that was foreign to the Greenland ice. There was no need to conjecture what it meant. 'It is a man ; it is moving,' broke out almost simultaneously from several lips, and it was immediately realised that the explorers of whom we were in quest were returning victoriously homeward. An instant later a second speck joined the first, and then a long black object, easily resolved by my field-glass into a sledge with dogs in harness, completed the strange vision of life upon the Greenland ice. Cheers and hurrahs followed in rapid succession—the first that had ever been given in a solitude whose silence, before that memorable summer, had never been broken by the voice of man. . . . Like a veritable giant, clad in a suit of deer and dogskin, and gracefully poised on Canadian snow-shoes, the conqueror from the far North (Lieutenant Peary) plunged down the mountain-slope."

La Route du Tchad, du Loango au Chari. Par Jean Dybowski. Illustré. Paris : Firmin, Didot et Cie, 1893. Pp. 381.

The route here described was from Loango across the French Congo territory to Brazzaville, and thence up the Congo and Ubangi rivers to Bembe ; after this, besides exploring the river Kemo, the traveller penetrated northwards over 200 miles on foot, across the country forming the watershed between the Congo basin on the south and the Shari, flowing towards Lake Chad, on the north. The last part of the journey was performed under difficulties, the route lying through deep marshes and dense thickets of reeds. Later on in the season the waters would have been lower, and the reeds dried up and burned. The author's object was to follow up and ascertain the fate of M. Crampel's expedition, in which he succeeded, and, having discovered the position of the band of "Mohammedans" by whom M. Crampel had been killed, he fell on them by night, killing several and dispersing

the rest. He crossed the Shari, but further progress was stopped by the impossibility of feeding his party, the country having been devastated by the Mohammedans. These the author considers to be the source of unmixed evil and misery to the settled, industrious, and comparatively peaceful heathen tribes, who are diligent cultivators, but, being without cohesion and badly armed, can offer no effectual resistance. According to M. Dybowski, these Mohammedan bands have no object but plunder. They do not cultivate, and only use trade as a pretext. Possibly he is unduly prejudiced; at all events, he urges his Government, in their own interest, to organise the tribes and help them to resist and expel the invaders, who, if once in possession, would be by no means so amenable to French influence and control.

The author alludes to the French trading posts, but says nothing as to the character or extent of the trade, mentioning only certain wild products such as coffee (which grows extensively, but of which the natives do not understand the use), cotton, caoutchouc, pine-apples, from which spirit might be distilled, and so on; but this is somewhat vague. More valuable are his descriptions and portraits of the various races he encountered, some of a type widely removed from the Negroid, and probably, judging by the patterns of their weapons and utensils, of a northern origin.

It is remarkable how soon after leaving the Equator a greater dryness of climate, and alternations of the seasons, were observed. The oil-palm, M. Dybowski says, is not found higher than 5° north lat., and the great tamarind trees, euphorbias, and other cactiform plants do not, he says, come farther south than this parallel.

Among other matters of interest, he mentions a wild palm, identical, he thinks, with *Phœnix dactylifera*, producing a small but edible fruit. So far as we know, the date-palm in North Africa only exists as a plant of cultivation.

The author was struck with the practice of beckoning with the palm or fingers downwards, instead of upwards as among ourselves, but the habit is very general out of Europe. We cannot but admire his diligence in collecting and recording varied information under great difficulties, including severe illness. His illustrations, too, seem taken from photographs and original drawings, and are not, as occasionally happens in these cases, *manufactures de Paris*.

A History of the Gold Coast of West Africa. By A. B. Ellis, Lt.-Col. London: Chapman and Hall, Ltd., 1893. Pp. 400. *Price* 10*s.* 6*d.*

Colonel Ellis is well known as an author, and he is a high authority upon West African matters. We therefore welcome his present volume, which will well maintain his reputation as an accurate observer. But it is of a different nature from his previous volumes, and deals with the history of the Gold Coast from 1393 to 1888. After giving a brief account of West Africa as known to the ancients, he shows that the discovery of tunnels which were driven into the hills to follow up a gold-bearing vein, and of remains of antique bronze lamps, designed to hold a wick floating in oil, prove that some ancient nation has been at work in the country. The occupation of the Portuguese, Dutch, and British is described. The Native States, as they existed in 1701, are next dealt with, and we also have an account of the formation of the Royal African Company, and also of the piracy which existed upon the west coast about 1750. The vicissitudes of the Gold Coast from that time onward are dealt with in detail, the various wars and their causes are described, and the reader lays down the book with a feeling of satisfaction that he has learnt all that is necessary to know of the Gold Coast in order to comprehend its present condition and its possibilities.

Portugal and its People : A History. By W. A. Salisbury. London, Edinburgh, and New York : T. Nelson and Sons, 1893. Pp. iv + 334. *Price* 3*s.* 6*d.*

Modern books on Portugal are all too few. The country having fallen from its former high position as a European Power, its present poverty, and consequent want of enterprise, have led us to exhibit less curiosity about a most interesting corner of the Continent than it deserves. Mr. Salisbury's volume is, therefore, most welcome. He has a story to tell, and tells it excellently, although considerations of space have made compression and omission imperative. Yet, so skilfully has this been done, and so well has the narrative been constructed, that, to use a rather worn-out but expressive phrase, there is not a dry page in the book, and the reader is carried sympathetically along from incident to incident and from period to period. Domestic politics and events have received due treatment, as well as the more thrilling tales of wars and invasions, of which the country has had its share. Geographers will be grateful for the introductory and concluding chapters, in which particulars are given regarding the physical aspects of Portugal, and descriptions of her various colonial possessions. The volume is clearly printed, neatly bound, and has a sufficient index and several illustrations.

Personal Narrative of a Pilgrimage to Al-Madinah and Meccah. By Captain Sir Richard F. Burton, K.C.M.G., F.R.G.S., etc. Edited by his Wife, Isabel Burton. Memorial Edition in 2 volumes. London : Tylston and Edwards, 1893. Vol. I. xxviii + 436 pp. Vol. II. xii + 479 pp.

To criticise so famous and well-established a classic as Burton's *Pilgrimage* would, of course, at this time of day be superfluous. This last edition of the work is very complete. The spelling of Oriental words has been revised in accordance with the author's later practice, and several new wood-cuts have been inserted. An appendix and various notes, which the maturer judgment of the author had omitted from recent editions revised by him, have been replaced. The volumes before us, of compact and convenient form, and in clear type, are the first of what is intended by Lady Burton to be a complete series of her husband's numerous publications. We welcome them, appearing under these pious and devoted auspices, as a fitting memorial to a very remarkable Englishman and one of the most distinguished travellers of the century.

In his preface the author can hardly have written "werthy" for worthy, or "Melchisedeck," or "coquette" for cocotte.

The Story of Africa and its Explorers. By Robert Brown, M.A., Ph.D., F.L.S., F.R.G.S. Vol. ii. London : Cassell and Co., 1893. Pp. 312. 200 Original Illustrations.

Dr. Brown's second volume maintains the high interest which appertained to the first. The present volume deals with the river of Egypt, the great lakes, the crossers of Africa, and the Congo. The greater part of the volume is by Dr. Brown himself, but a few of the chapters are by other authors. Dr. James Murie writes on the seekers after the source of the Nile ; Mr. F. E. Harman aids in the description of Livingstone's travels ; Captain V. L. Cameron has partly written one chapter, giving an account of his journey across Africa ; and Dr. Felkin contributes the chapter on "Through the Dark Continent :" the exploration of the Congo. Dr. Brown has managed with distinct success, not only to carry the reader with him through his pages with increasing interest, but at the same time to contribute an enormous mass of detail in an entertaining and by no means tedious manner. He has certainly had no easy task, for the literature on the subject is very great, and

yet all seems to have been laid under contribution, and full references are given to the sources of the information offered to the reader. The spirited and artistic illustrations again form a feature in the book ; indeed, if possible, this volume is illustrated in a superior manner to the first. Both author and publisher are to be congratulated, and the work can be confidently recommended, not only for its accuracy but for its living interest.

Die Wahrheit über Emin Pasha. Von Vita Hassan. Zweiter Teil. Berlin : Dietrich Reimer, 1893. Pp. 246. Index and Map.

We have already referred in our pages to the first part of this book. The second commences with the arrival of the information of the invasion by the Mahdi's troops of the Bahr-el-Ghazal district, and ends with the arrival of the "rescued" part of the garrison of the Equatorial Provinces at Bagamoyo. The author's stay with Kabrega is well described, and of much interest, and for those who are anxious to learn more of the details of the Relief Expedition the volume can be commended. On the whole, however, as most of those concerned in the events with which it deals have passed away, it will be probably best if the whole matter sinks into oblivion.

James Thomason. By Sir Richard Temple, Bart., M.P., G.C.S.I., D.C.L., LL.D., formerly Lieutenant-Governor of Bengal and Governor of Bombay. With Portrait. Oxford : At the Clarendon Press, 1892. Pp. 216. *Price* 3*s.* 6*d.*

The name of James Thomason, though familiar to those who have served in Northern India, is probably not so well known to the English public generally as are the names of many others who have gained distinction in India ; but in his own sphere, as the ruler of a great Indian province, he has had no superior, and of all the rulers whom England has furnished to India there is none whose memory deserves to be more warmly cherished or held in higher honour. He was endowed with a vigorous, well-balanced mind—a mind that was ever active, seemed to know no weariness, and grappled easily with the hardest problems : but his greatness was rather that of beautiful and strong character than of brilliant intellectual gifts. It is to be regretted that his life was not written at an earlier date, when materials for it were more abundant. Sir R. Temple, who has undertaken it for the series of "Rulers of India," has qualifications which fit him to do justice to his subject ; but, however admirable in some ways the result is, it is not all that was to be desired. He has dealt at some length and to good purpose with three of the most important branches of Thomason's administrative activity. These are : the settlement of the land revenue and the recording of rights in land, the construction of the great Ganges Canal, and the establishing of a system of elementary vernacular education. With all of these he was identified to an extent, and accomplished results, which will make his name ever memorable. In regard to the last, Lord Dalhousie recorded after his death that, even if Thomason had left no other memorial of his public life, "this would have sufficed to build up for him a noble and abiding monument of his earthly career." But to get an adequate idea of his power and importance as a Governor, it would have been necessary to follow him into all the various departments of his administration, and to show in greater detail the process by which, as one officer wrote of him, he contrived to brace up the administration till it became the model Government of Asia. Such a history could have been written only by one who had a thorough acquaintance with the state of district administration in the North-Western Provinces when he took charge, and its condition when the reins dropped from his hands. It would have involved great labour, and probably now it is impracticable, owing to the loss of records in the

Mutiny; but if well done it would have been most valuable. Sir Richard Temple has kept to generalities, and, however fervid his eulogy, yet on the public side of the life one sometimes misses the detail which would have given point to his praise. On the other hand, he has dwelt at considerable length on the private and personal side of Thomason's life. That he should have done so is very intelligible, and what is told will all have an interest for those who admire and wish to understand the man; but the subject occupies a disproportionate space for a memoir of the kind that was required. Sir Richard also has rather overloaded his description of the scenes amidst which Thomason worked, with detail that is superfluous and sometimes trivial; but, on the whole, the main object of the memoir has, notwithstanding some drawbacks, been in a great measure attained, for he has brought out forcibly the essential nobility and greatness of Thomason, and shown how and why he charmed and impressed all who came in contact with him or served under him.

Rulers of India: Lord Clive. By Colonel Malleson, C.S.I. Oxford: At the Clarendon Press, 1893. Pp. 229. *Price* 2*s.* 6*d.*

The career of Lord Clive in India can never cease to have a deep interest for Englishmen. His marvellous audacity, fertility of resource, and thorough command of all his great powers in the face of sudden and seemingly overwhelming peril give the story of his life all the attractiveness of romance, while every lover of his country's greatness must follow his progress with eager admiration as he defeats the attempt of the French to establish their supremacy in Southern India, avenges the Black Hole disaster of Calcutta, and gains for England in Bengal the position which is the origin of the great empire that has now been reared. The subject could not have fallen into better hands than those of Colonel Malleson, who has for many years made a thorough study of the growth of the English power in India in the eighteenth century, and especially of the struggle with their French rivals. He has given a most spirited and graphic account of the dashing exploits by which Clive distinguished himself in Madras, when circumstances led him to exchange his place in the Civil establishment of the Company for a soldier's life, and gave the opportunity for the display of his great ability. Nor is he less successful when relating the conquest of Bengal and describing how Clive as the first Governor-General rectified the abuses which had grown up in his absence, and laid the foundation of good government. It is no disparagement to say that Colonel Malleson writes as an enthusiastic admirer, nor is his work less valuable because he is more disposed to magnify than to belittle his subject, and brings into prominence his heroic qualities. The simple story of Clive's life is fitted to produce this attitude in a biographer. For beyond question Clive was a strong man, a born leader of men, not by any means faultless, but one who grew intellectually and morally as a wider field of action opened before him, and who, as a ruler in India, won for himself no mean rank.

The Currencies of the Hindu States of Rájputána. By William W. Webb, M.B. Westminster: A. Constable and Co., 1893. Royal 8vo. Pp. xxii + 136.

Of this work, one of the first of its kind on Indian local currencies, only 400 copies have been printed, so that it is likely to become scarce, at least in this country. It is written with a wide knowledge of the subject, in a clear and instructive style, and illustrated with twelve lithograph plates, in some cases giving the design on the coins on an enlarged scale, with a blank figure to represent the actual size of the piece. The map showing the mint towns of Rájputána is coloured to indicate the clans of the ruling chiefs, and has the mint towns

printed in red. It is executed with all J. Bartholomew and Co.'s usual taste and accuracy, the revised spellings being almost exclusively employed, with an odd mixed exception, however, in "Rann of Cutch." The book contains summaries of information respecting the extent, revenues, population, and histories of the States of Rájputána whose coinages are described, all (except perhaps Mewar) being of quite recent origin—mints having been established only during the last stage of the decline of the Mogul power, and then in name of the emperors—and now we find such legends in Persian as *Her Majesty Kueen Viktoria of Ingland and Hindústán, struck in the House of Victory at Jodhpur*; and a gold coin of Udaypur, having on the reverse, *Dosti Landhan*, "Friendship with London."

Les Pyrénées. Développement de la connaissance géographique de la chaîne. By Dr. P. Camena d'Almeida. Paris: Armand Colin and Co. Pp. 328.

The name "Pyrenees" is said to occur for the first time in Herodotus, being derived from Πυρήνης, a town which he places near the source of the Danube, a river which Herodotus thought took its rise in the Pyrenees, just as Aristotle believed that the Guadalquivir rose there also. Pliny the Elder was the first to describe the Pyrenees as extending from east to west, instead of from north to south. The ancients crossed the Pyrenees by three great routes, viz.: *first* (and most frequented) from Narbonne to Barcelona *via* Gerona; *second*, from Dax to Jaca and Zaragoza; and *third*, from Dax to Pamplona. By the last-named route (that of the "Col de Roncevaux") the English troops crossed from France into Spain in 1367.

It was not till the close of the 17th century that the Pyrenees began to be scientifically investigated. The celebrated Tournefort botanised there from 1681-8. Scientific cartography was first applied to the Pyrenees by Roussel, who issued his military map in 1720; but even in it orthography and elevations are occasionally unreliable, whilst the Spanish side of the mountains, not having been visited, is purely conjectural. The best account of the Pyrenees in the 18th century is contained in a long military memoir by the Maréchal de Noailles, which exists only in manuscript, and is kept in the Library of Rouen.

In 1797 Ramond discovered fossil organisms in the rocks forming one of the highest summits of the Pyrenees (Le Mont Perdu) at a height of about 10,000 feet above the sea. Dufrenoy and Elie de Beaumont constructed the first geological map of France, which was rectified as regards the Pyrenees by Leymerie, whose researches extend from 1844 onwards. Dr. D'Almeida shows how the elevation theory which Elie de Beaumont applied to the Pyrenees and other mountain-chains was combated by Constant Prévost, and was abandoned by modern French geologists in favour of the theory of lateral plications occasioned by contractions of the globe whilst cooling. The author evinces a masterly grasp of his subject, and cites every authority on the Pyrenees in chronological sequence. He concludes with a chapter on the cartography of the Pyrenees, pointing out that the most perfect maps are those of M. Franz Schrader, who has, since 1869, devoted himself to the survey of the mountain-chain. As a lucid introduction to the scientific study of the Pyrenees, and as a book of reference to Pyrenean scientific literature, Dr. D'Almeida's volume will be found invaluable. A good geological map of the chain (based on that of Messrs. de Margerie and Schrader, published in 1892) and an index would have rendered the volume complete.

The Parish of Fordoun: Chapters in its History, Reminiscences of Place and Character. By Charles A. Mollyson. Aberdeen: John Rae Smith and D. Wyllie and Sons, 1893. Pp. xxvi + 341.

This is a fair, though not, as the writer humbly acknowledges, a first-rate specimen

of the parochial history of which the interest consists chiefly in the reminiscences of the author. The more remote annals of the parish are collected for the most part from well-known sources. Fordoun has a good name amongst the parishes of Scotland as the reputed seat of the mission of St. Palladius, though the statement of Prosper of Aquitaine that he was sent by Pope Celestine, "ad Scotos in Christo credentes," in the fifth century, makes it probable that Ireland and not Scotland was the scene of his mission, for in that century there were, so far as we know, no Scots in Scotland and no Christians in the Mearns till he came there. The tradition, dating from at least 1244, when David de Bernham consecrated a church dedicated to the Saint, part of whose ruins still perhaps exist, cannot outweigh this argument. It is probable, however, that Palladius died at Fordoun. There seems no reason to doubt, though it has been doubted, that John de Fordun, the first prose chronicler of Scotland, who died towards the end of the fourteenth century, received his name from the parish as the Latin verses in the early MS. so style him, and there is no other place of the same name.

It is quite possible that a portion of the old church of Fordoun may be older than the one Bernham consecrated. The Celtic Cross, of which a photograph is given, and in which Ogham characters have recently been detected, is certainly prior to that date. The well, still called the well of St. Palladius, and the traditions of Paldy's fair still held on the day of the Saint, are circumstances not to be left out of account in favour of the connection of the parish with the Saint. This fair is now stripped of its ancient honours and humours, but Mr. Mollyson gives a lively description of it as he saw it forty years ago: "There were the vintners' tents set up with the regularity of a military encampment with blazing fires behind and broth-pots suspended from tripods." "There was poet John Milne reciting his own compositions and extolling the occupation of the ploughman as superior to that of every other craft." "There were blind fiddlers and pipers clad in the garb of Rob Roy. There were vendors of Belfast Almanacs, then an essential article in every country household." "Hither dealers in sheep, cattle, or horses congregated from every parish in the county, as also from Forfarshire and across the hills from Dundee. We have heard of the presence of 'the rough tykes' of Tarland with boxing propensities. . . . Need it be wondered that before sunset various methods of settling accounts had been adopted, and that some veterans were left for the time *hors de combat*?"

It is in such personal recollections, and not in more distant historical research, that most of this book lies. Thus we have sketches of the parochial schoolmasters, and the baron bailies, the carriers, millers, and weavers, bank agents and bill discounters, as well as of the feuars, leaseholders and landowners, whose genealogies have been carefully noted. The histories of the separate baronies of Glenfarquhar, Redhall and Mondynes and other estates in the parish, Leithfield, Phesdo, Monboddo, Fettercairn, and others, are briefly traced. The eminent men of the parish do not appear, if we may trust Mr. Mollyson, to have been many. George Wishart the martyr's connection with it was ancestral rather than personal, and there remain only the eccentric Lord Monboddo, Professor Alexander Hamilton, the surgeon, James Beattie, nephew of the author of the *Minstrel* and the *Essay on Truth*, and John Stuart, better known for his essays on the antiquities of his native county, than as Professor of Greek at Marischal College. The chapters on the geography of Fordoun, its rivers, hills, woods, and glens are somewhat scanty, and so are those on its botany and zoology. The writer is at his best in describing the old farming customs and farms of his youthful days. His work is plainly written, and quite free from any fault of exaggeration or affectation, but its arrangement indicates that, though an old man, the

writer is a young author. It will doubtless interest many of his fellow-parishioners, and those who care to know the *minutiæ* of daily life in a somewhat remote northern parish fifty years ago before railways and the Disruption.

History of Nairnshire. By GEORGE BAIN. Nairn: *Telegraph* Office, 1893. Pp. 600.

The pages of this *Magazine* have frequently borne witness to the importance and value which local histories have for the geographer by bringing out details that cannot be touched upon in books treating of larger subjects, and by throwing side-lights upon bygone customs, manners, and beliefs. The work before us is a model county history. Detailed, accurate, generally unbiassed, it is pleasant to read, and full of information on every page. The scope, also, is wide; and while, besides history proper, attention is given to such subjects as antiquities, genealogies, and customs, balance has been successfully preserved throughout. Moreover, the author is exceedingly careful not to commit himself in matters which, in his opinion, have not been clearly settled by competent authorities. Thus, in discussing the site of Ekkialsbakki, he appears to agree with Dr. Skene that it must be sought for somewhere near the Findhorn, and not at the Oykel, as has been supposed. Yet he is not satisfied, apparently, that the last word has been said upon the subject. If he is right, a new derivation must be looked for for Cyder Hall, which has been generally assumed to be a form of Sigurd's Haugh, and intimately associated with the fighting at Ekkialsbakki, as related in the *Orkneyinga Saga* and by Torphæus in his later work. We are, however, strongly inclined to agree with Dr. Anderson, who, in his notes to the *Saga*, points out that there were, probably, two places of similar name—one on the Oykel, the other on Moray Firth—and that the condenser of the *Saga* most likely fell into error when writing the name of the latter, which might well mean "the coast next to Atholl." Very interesting is the story of the introduction of Christianity into the North as here related; and the remarks upon the dedications of the early chapels are of great value in showing the favourite saints, some now forgotten, at the dawn of authentic history. As the history proceeds it gains in interest. Papers can be referred to, incident is more common, and the makers and destroyers of Nairnshire stand out as actual personages, and not the shadowy characters of which we can but catch an uncertain and fleeting glimpse in the mists of antiquity. The battle of Auldearn gives Mr. Bain an opportunity for some spirited description, in the course of which he throws new light upon Montrose's dispositions to receive the attack of Hurry. But one of the most curious pieces of information we find in the description of the funeral of Sir Hugh Campbell of Cawdor in 1716, carried out in the usual Highland manner of the time, regardless of expense, costing no less a sum than £1647, 16s. 4d., including £92, 8s. for brandy (some of it at 48s. per pint); tobacco, pipes, fruits, and spices, £407, 8s. 4d.; claret, £107, 10s.; and butcher's meat, fowls, and game, £55, 15s.! All the gentlemen attending the funeral came well mounted. Lord Lovat, attended by Major "Cracks" of Castleleathers and other followers, had remarkably fine horses, which were much admired by all present; but it came out, before the ceremony was concluded, that they had all been stolen from the Thunderton stable a short time previously! The story of the '45, in so far as it affected the district, makes excellent reading; but perhaps the chapter that describes the burgh of Nairn in the past will prove of greatest interest to the general reader. Want of space has compelled Mr. Bain to reject a mass of historical documents he had intended to quote in an appendix; room has only been found for a list of the provosts of Nairn from 1450 to 1892. From the first-mentioned year down to 1761, the office was uninterruptedly held by members of

the family of Rose; and out of the total list of 81 chief magistrates, 45 belong to that family.

If a second edition of this book is called for, as we hope it will be, a better index should be compiled, and attention given to the uniform spelling of place-names. A good map of the county would also be a welcome addition. Meanwhile, we must reluctantly bid farewell to the historian's fascinating pages, warmly recommending them to the attention of all interested in Scottish history and geography.

Byways of the Scottish Border: A Pedestrian Pilgrimage. By GEORGE EYRE-TODD. Selkirk: James Lewis, 1893. Pp. 226. *Price 4s. 6d. net.*

A remarkably attractive and well-written account of the Scottish Border, embellished with excellent illustrations by Mr. Tom Scott, A.R.S.A. Besides pointing out the natural beauties of its scenery, Mr. Eyre-Todd describes in elegant and often picturesque language many of the events which have endowed the Border with lasting interest to the historian, poet, and traveller. From Yarrow to Flodden, from Fernihirst to Ercildoune, all the Border country seems familiar to him, and finds in him a diligent student and enthusiastic admirer. As a specimen of his style, we may quote this passage from the chapter entitled "In the Wizard's Country":—

"Cistercian Melrose, russet-grey, hemmed by river and town! For nigh three hundred and fifty years the voice of the ancient faith has been silent amid its ruins; but sweet enough once was the sound of its bells, as the angelus floated out over flood and field, and the rude Borderer in the saddle and the simple peasant on the lea stopped to listen and cross themselves and murmur a prayer. Here, and in convent and monastery elsewhere, though the fact is too often forgotten, the flickering light of civilisation was kept alive, sheltered within the quiet cloisters, through a dark and stormy age. Arts, letters, commerce, and agriculture, as well as religion, alike owe their preservation to the men who dwelt long ago in these religious houses."

For a future edition, we venture to point out a few errata in this otherwise admirable work. At page 7 "Bodseck" should be Bodesbeck: and at page 112 "Hyton" should be Heiton. At page 127 the ridiculous etymology of Melrose, "Malerose or sullied rose," should be omitted, and the derivation of the place-name should be given as probably from the two Gaelic words *meall* and *ros*, signifying "a high promontory" (alluding to the site of Old Melrose). At page 115 John Morvo or Morow, the Parisian master of work during the re-erection of Melrose Abbey in the 14th century, is said to be "probably a member of the Scottish family of Murray," but, being a Frenchman, he may more probably have belonged to the family of Moreau. At page 142 Dryburgh Abbey is said to be "now owned by the Earls of Buchan," whereas its present proprietor is Mr. Biber Erskine. Its monks belonged to the Premonstratensian (or Norbertine) order, which is spelt at page 163 "Premonstrentian." An index and a map would have rendered the volume more useful and complete.

Pictures from the German Fatherland: Drawn with Pen and Pencil. By the Rev. SAMUEL G. GREEN, D.D. Pp. 224. *Price 8s.*

Icelandic Pictures: Drawn with Pen and Pencil. By FREDERICK W. W. HOWELL, F.R.G.S. Pp. 176. *Price 8s.* London: The Religious Tract Society, 1893.

The first of these beautiful volumes is a new edition of one of the Rev. Dr. Green's contributions to this excellent series. It has been revised, and a number of new illustrations have been added to the original rich collection of plates.

The second volume is from the pen of Mr. Howell, whose travels and explorations in Iceland, noted from time to time in the pages of this *Magazine*, clearly indicated his fitness for the authorship of an account of the island ; and his work, as here presented, leaves little to be desired in any way. The illustrations are numerous and beautifully produced, while the reading matter is always interesting and instructive. The chapter dealing with the history of the island, especially, is written with a nervous force of language well suited to the theme. Doubtless a perusal of these fascinating pages will make many readers long to see for themselves what is here so well represented on paper. The volume is, in more ways than one, the best of the series that has come under our notice. The map is very rough, however, and there is no index.

Chips by an Old Chum: or, Australia in the Fifties. London, Paris, and Melbourne : Cassell and Co. (Limited), N.D. Pp. 94. *Price* 1*s.*

The recollections of the author will appeal more strongly to other "old chums" who remember the Australia of the gold rush ; but the general reader may pleasantly, and, to a certain extent, profitably, spend an idle hour over the well-printed pages.

Étude Économique sur la République de Nicaragua. Par DÉSIRÉ PECTOR, Consul de Nicaragua à Paris. Neuchâtel : Soc. Neuchâteloise d'Imprimerie, 1893. Pp. 167.

This pamphlet is a reprint from the *Bull. de la Soc. Neuchâteloise de Géographie*, and gives many details on the lines of steamers running to Nicaragua, the ports, means of internal communication, etc. A large part of the volume is devoted to a gazetteer of the country, from which may be gathered much useful information regarding mines, cattle-grazing, and other forms of industry. There are also some simple but useful maps, and a somewhat long list of corrections.

The Historical School Geography. By DR. CHARLES MORRISON, M.A., F.R.G.S. New Edition, revised and extended by W. L. Carrie, M.A. London : Edward Arnold, 1893. Pp. 388. *Price* 3*s.* 6*d.*

In this new edition of Dr. Morrison's *Historical Geography*, the work has been very thoroughly revised—so thoroughly that it has been set up in new type from beginning to end. The author's general plan has been in the main adhered to, but the matter has been completely overhauled, and, in regard to statistical information and territorial changes, the book embodies the latest information available. The net additions to the volume amount to 20 pages ; but that fact by no means indicates the measure of the extensions, as room has been made for new matter throughout the volume by judicious curtailment of the old. The Editor, Mr. W. L. Carrie, has done his work admirably. He has added materially to the value of the book as an exposition of geography from the historical standpoint, and he has kept well in view its adaptation to educational requirements. The critic naturally turns to those portions of the book which deal with recent re-arrangements of territory. East Africa, South Africa, and the Eastern Peninsula are the regions that occur to one as affording a test both of recent and of accurate information ; and, in all these cases, the work stands the severest test in the most satisfactory manner. The book is not only an excellent text-book, but it also forms most interesting reading : of how few geographies can that be said ?

Allgemeine Meereskunde. Von JOHANNES WALTHER. (Weber's Naturwissenschaftliche Bibliothek.) 8vo. Leipzig: J. J. Weber, 1893. Pp. xvi + 296. 72 Figs., 1 Map. *Price* 4 *M.*

We find a certain interest in comparing a volume of this German series with its analogue in Britain—for instance, with Dr. H. R. Mill's *Realm of Nature*—and we have some patriotic pleasure in observing that our British volume is the better bargain. The two books do not differ greatly in dimensions, or in price, but there is much more matter in the British book, and there is better paper, better printing, and more careful illustrations.

None the less is Dr. Walther's book a very successful one. The author has learned the art of brevity, which is not supposed to be instinctive in Germans, and he tells the story of the sea clearly, briskly, and often with a pleasant picturesqueness. The book is divided into twenty-five short chapters, dealing with the history of oceanography: the depth of the sea and its changes; the surface of the sea and the work of its waves; the temperature, the colour, and the currents of the sea; the life of the sea and its distribution; the deposits, the volcanoes, the islands; and so on. It is a marvel of compression, and yet it is not dull; not a book for the learned, but for the beginner; one, moreover, which will leave the reader with an appetite. Many of the illustrations have the virtue of freshness, but the execution of most is very rough. There is also a blot at the end of the book, namely, the bibliography, which is very carelessly done—and this from a German!

Katechismus der Meteorologie. Von PROF. DR. W. J. VAN BEBBER. Leipzig: J. J. Weber, 1893. Pp. 259. Sixty-three Illustrations.

The author of this book has adopted the catechism method of impressing his facts upon the reader; and in many ways the method seems to commend itself. The questions are distinct, the answers to the point, and, where necessary, diagrams have been freely employed. It is perhaps, too, an advantage that, on account of the method adopted, the book cannot be so easily skimmed, and it is very convenient for reference. We should imagine that teachers would find the book of considerable service, especially as the author is very accurate, and by no means prolix.

Gazetteer of the British Isles, Statistical and Topographical, with Census Supplement 1891, *and Appendices.* Edited by JOHN BARTHOLOMEW, F.R.G.S. Edinburgh: John Bartholomew and Co. London: Simpkin, Marshall, Hamilton, Kent, and Co., 1893. Pp. 880 + xxxi. *Price* 12*s.* 6*d.*; *half-bound*, 15*s.*

A practical acquaintance, now extending over several years, with the first edition of this work, and comparison with other volumes of a similar kind, have convinced us that it is unequalled for the extent and general accuracy of its rubric, and the compact form in which a large mass of information has been set forth. This new edition is a reprint of the other, with the addition of census and statistical tables, and the omission of the maps. This being the case, the details are frequently not up to date, none of the changes brought about by recent ordinances of the Boundary Commissioners being noticed; but, as full particulars regarding these alterations are not yet available, the publishers have, perhaps, done wisely in waiting until a further issue will admit of them being given in a complete form. The volume is handsomely and strongly bound and well printed. To those who already know its value, the mention of the issue of this new edition will be sufficient.

Illustrated Official Handbook of the Cape and South Africa: A Résumé of the History, Conditions, Populations, Productions, and Resources of the several Colonies, States, and Territories. Edited by JOHN NOBLE. London: Stanford. Cape Town, etc.: Juta and Co., 1893. Pp. xvi + 568. *Price* 8*s.* 6*d.*

It is unnecessary to refer to the former edition of this *Handbook*, published some years ago for the Colonial Exhibition, as the volume has been nearly doubled in size, and is practically a new work—fulfilling very fairly the comprehensive promise of its title. The editor has wisely intrusted each of the various economic, industrial, and scientific departments of the work to experts entitled to speak with authority in their respective branches, with the result that a mass of useful and dependable information on almost every subject that a reader could require is laid before him. Some of the papers, as that which deals with the diamond industry, are in fact exhaustive. The chapters on the flora and on the woods and forests are also very instructive. That on the vertebrate fauna is also full of interest, and it is to be regretted that so distinguished a naturalist as Mr. Trimen could not, in the space allotted him, deal with the fauna in its entirety. The history of the colony, from the first advent of the Dutch to the present day, is given at some length, and the various thorny questions involved are treated (when touched on at all) with fairness and moderation. The clear *résumé* of events, taken in conjunction with the description of each of the different territories and races, and of the gradual material development of the whole region, gives at all events a plain and distinct bird's-eye view of what, governmentally and otherwise, must be admitted to be a complicated situation, comprising so many widely differing and sometimes antagonistic interests, political and industrial. Mr. Noble points to the great development within the last few years of the natural resources of the country, and to the openings for capital and emigration. While not ignoring the drawbacks which exist, or confidently asserting that the country has a great future before it, we may admit that for both capital and immigration many fair openings still exist. The Colony, for instance, does not yet regularly produce wheat enough for its own consumption. The chapters relating to the South Africa Company, and the condition and proclivities of the different native races, including Bechuanas, Matabeles, and Mashonas, will be referred to with special interest at the present time. Native affairs are administered directly by the Governor of the Colony as High Commissioner, independently of his Cabinet, and their direction just now must tax even the exceptional experience and sound judgment of the present holder of that office.

The illustrations in this volume are useful, but not artistically satisfactory; and the absence of an index is a serious omission in a work of the kind.

Notes of some of the more Common Diseases in Queensland in relation to Atmospheric Conditions, 1887-1891. By DAVID HARDIE, M.D. Brisbane: James C. Beal, Government Printer, 1893. Pp. 126, Appendix, and numerous Charts in Case.

The broad claim made for geography at the recent meeting of the British Association at Nottingham certainly justifies a reference to this book in our pages. It follows the lines of Sir Arthur Mitchell and Dr. A. Buchan's work on the influence of weather upon disease, and endeavours to establish on a more or less certain basis the connection between the condition of the weather and a few of the more common diseases. More attention should certainly be paid to this subject, for it is quite possible that with more accurate knowledge a considerable amount of disease might be prevented; and seasonal forecasts in this connection can hardly be overestimated, for doubtless individuals predisposed to certain diseases much influenced

by weather might take warning in time, just as mariners do of approaching storms. Dr. Hardie has written a most interesting account of the relation of such diseases as diphtheria and croup, whooping-cough, pneumonia and bronchitis, diarrhœa and dysentery, etc. to the weather experienced in Australia during the years under review; and he points out in each case conclusively what, if any, influence weather has upon the incidence, progress, and disappearance of the diseases. This is a book which should be attentively considered by all physicians and sanitarians, and we hope that the investigation set on foot will not only be carried on in Australia but will be extended everywhere. The charts are well produced.

Handbook to Denmark, with Schleswig and Holstein, and Iceland. 6th Edition. London: John Murray, 1893. Pp. 153. *Price* 6*s.*

In addition to an entirely re-arranged and largely rewritten "Handbook to Denmark," we have here a brief but comprehensive guide to Iceland, carefully revised by a resident on the spot. The peculiar difficulties of travelling in Iceland are pointed out. There are scarcely any roads, properly so called. Formerly tourists lodged either in churches or filthy farmhouses. The churches are not now available, as "owing to the behaviour of some people, a few years ago, in Thingvellir Church, permission to use them has been withdrawn by the Bishop." Some of the farmhouses are now clean and comfortable, and, where they are not, the traveller must live in his tent. Until inns are established in the interior of Iceland, it will never become attractive to tourists; but, once decent accommodation is provided, it may develop into a northern Switzerland. "There is no country so near home in which exploration can be so easily attempted." Its virgin peaks, unexplored deserts, and enormous *jöklar* (or high lands covered with snow and ice), one of which, the *Vatna Jökull*, exceeds the size of Devonshire, appeal to Alpine Club men, and to the young and enterprising generally. This handbook furnishes them with excellent routes and maps.

Deeside. By Alexander Inkson M'Connochie. Aberdeen: D. Wyllie and Son, 1893. Pp. 160. *Price* 1*s.*; *cloth*, 2*s.*

In this little volume Mr. M'Connochie displays those facile powers of description and the painstaking detail which have rendered popular former works from his pen. After devoting some space to a general description of the Dee, he begins with Aberdeen, at its mouth, and afterwards conducts the reader up Deeside to the source of the stream. The volume is of handy pocket size, and has a good map and full index.

The Deeside Guide: Descriptive and Traditionary. Aberdeen: Lewis Smith and Son, n.d. Pp. 115. *Price* 1*s.*

This *Guide* is a decided improvement upon most of its class, the aim being rather to interest the tourist in the places described than to merely catalogue objects that he is perfectly able to see for himself. To this end the treasure of fine old—if frequently rough and rugged—ballad poetry of the district has been freely drawn upon, generally with an exceedingly satisfactory result. The book is a neat production, fairly well illustrated, and with a serviceable map. But it ought to have been dated, and to have had an index in place of, or in addition to, the table of contents.

A New Guide to Lochbroom. By Aliquis. Dingwall: A. M. Ross and Co. Pp. 20. *Price* 3*d.*

Although written in a somewhat rough style and far from detailed in treatment, we are inclined to think that this little *Guide* ought to do somewhat towards inducing tourists to visit a district at present but little frequented, though it abounds in grand Highland scenery and is not very difficult of access.

Walker's Tourist's Guide to Montrose and District. Montrose: Matthew Welsh, 1893. Pp. viii + 79. *Price* 6*d.*

We have here a fairly creditable guide to Montrose and its surroundings, likely to be of use to tourists and others visiting that pleasant little town. The general historical outline is very meagre, but under the various headings and divisions a fairly sufficient amount of reliable miscellaneous matter has been arranged. The plan of the town is good, but the illustrations are rough.

Wick: In and Around it. By John Horne. Wick: W. Rae, 1893. Pp. 42. *Price* 6*d.*

In a pleasant, chatty style Pastor Horne tells us what to see in and around Wick. The matter is good, so far as it goes, but much more might have been made out of the various subjects treated of. It will, however, prove a useful companion to any one visiting the town, and ought to be of considerable interest to the inhabitants. The publisher has issued a very tasteful little volume.

Buxton: Its Baths and Climate. By Samuel Hyde, M.D., etc. Second Edition. London and Bristol: John Heywood, 1893. Pp. xiii + 134. *Price* 2*s.* 6*d.*

Dr. Hyde's little book was first published in 1889, and its success has made a second edition necessary. Apart from its intrinsic value as an accurate account of Buxton and the neighbourhood, it is of service as showing that in this country there is a health resort which even in winter compares favourably with many of the Continental spas.

Facts and Figures about Ireland. Part II. By Thomas Wrigley Grimshaw, M.A., M.D., Registrar-General for Ireland. Dublin: Hodges, Figgis, and Co. (Ltd.). London: Simpkin, Marshall, Hamilton, Kent, and Co. (Ltd.), 1893. Pp. 24. *Price* 1*s.*

As we can see nothing to indicate whether this is the concluding portion of Dr. Grimshaw's work or not, it is extremely difficult to pronounce upon its merits. But this much we may say, that, should it unfortunately go no further, it is still a mine of wealth to the political geographer and to all those interested in statistics, while it ought to strongly appeal to the general public at the present time. Besides the paged matter, a large number of statistics are presented in tabular form on separate folding sheets. The first part of the work was noticed on p. 556.

Health and Pleasure on America's Greatest Railroad.

The New York Central and Hudson River Railroad extends over a distance of 440 miles, from New York to Buffalo, and, together with its connected lines, affords means of approach to a large number of favourite health resorts, and to much of the most noted scenery of the States and Canada. In the Guide-book, which is published by Mr. G. H. Daniels, General Passenger Agent, information is given relating to more than one thousand tours, and the volume is adorned with some excellent illustrations, and is furnished with maps. Smaller pamphlets also are issued by the Company, giving full details about particular tours.

Australia and America in 1892: *A Contrast.* By EDWARD DOWLING. Sydney: Charles Potter, Government Printer, 1893. Pp. xiii + 172.

In this volume are collected a large number of statistics and information of various kinds relating to the Australian Colonies and North America, which show the remarkable progress made by these countries. The author, being an Australian, may be excused, or, rather, commended, for occasionally reviewing the prospects of his own country in a too favourable light. They are no doubt promising, but Australia has certainly disadvantages; for instance, the rainfall over more than a third of the continent is less than 10 inches. There is much useful matter in this book, but it might have been better arranged.

NEW MAPS.

EUROPE.

SCHLESWIG, Kustenänderungen im südwestlichen ——. Von Dr. R. Hansen Massstab 1 : 275,000.

I. Südwest-Schleswig um 1240. II. Südwest-Schleswig von 1634. III. Südwest-Schleswig im Jahre 1892. *Petermanns Mitteilungen, Tafel* 12, 1893.

ASIA.

NORD- UND MITTEL-ASIEN, Russische Bahnprojekte, in ——. Entworfen von F. Immanuel. Massstab 1 : 20,000,000.

Petermanns Geogr. Mitteilungen, Jahrgang 1893, *Tafel* 8.

CHINESE TURKISTAN, showing the Surveys and Routes of Col. M. B. Pevtsof and K. I. Bogdanovitch. Scale 1 : 3,800,000.

The Geographical Journal, July 1893.

FRENCH INDO-CHINA AND SIAM, to illustrate journeys by Hon. G. Curzon, M.P. Natural scale 1 : 4,000,000. *The Geographical Journal, Sept.* 1893.

HINDUKUSCH-GEBIRGES, Karte des nordöstlichen ——. Gezeichnet von Fr. Immanuel. Massstab 1 : 2,500,000.

Petermanns Mitteilungen, Tafel 13, 1893.

AFRICA.

TANA-FLUSS ZUM GUASSO-NJIRO, Originalkarte der Expedition Wm. Astor Chanlers vom ——. Aufgenommen und gezeichnet von L. Ritter v. Höhnel, K. und K. Linienschiffsleutnant. Massstab 1 : 500,000. Nebenkarte: Geologische Skizze des Reisegebietes. *Petermanns Mitteilungen, Tafel* 9, 1893.

NORDWEST-PATAGONIEN, Original-Karte des Limay-Gebietes in ——. Nach eigenen Aufnahmen entworfen und gezeichnet von Dr. Josef von Siemiradzki. Massstab 1:1,000,000. Nebenkarten: 1. Der Südliche Teil der Pampa Central. Massstab 1:1,000,000. 2. Uebersicht der Expedition von Siemiradzki, 1891-92. *Petermann's Geographische Mitteilungen, Jahrgang* 1893, *Tafel* 5.

AMERICA.

REPUBLICA ARGENTINA, Mapa General de los Ferro-Carriles de la ——, segun los datos mas nuevos por Carlos F. V. Hansen. 1893.

Buenos Aires: Se vende en la Libreria Alemana de Ernst Nolte.

As the title shows, this is a railway map, and embraces, therefore, only that

part of the Republic which is opened up by railways. The gauges are distinguished by the strength of the lines, and the names of the railways are given in an index, with corresponding figures on the map. The Provinces are distinguished by different tints. The map is based on good information, and is up to date.

OCEANIA.

AUCKLAND, Map of the Province of ——. Sheet No. 5. Scale 1 : 253,440 or 4 miles to 1 inch.

TARANAKI, Map of ——. Scale, 1 : 253,440, or 4 miles to 1 inch.
Department of Lands and Survey, Wellington, N.Z.
Percy Smith, Surveyor-General.

Both these maps are based on actual survey, and show the boundaries of the Crown lands, native lands, and estates. Townships and places with post and telephone offices are specially marked. All railways, main roads, and native tracks, as well as parish boundaries, are laid down. Maps on such a large scale would be more useful to geographers if the physical aspects of the country were indicated by colouring.

ATLAS.

UNITED STATES, Geologic Atlas of the ——.
U.S. Geological Survey, Washington, D.C., 1892.

The issue of the Atlas for the year 1892 comprises five fasciculi containing from six to eight folio sheets. These refer respectively to the following sheets of the map :—Chattanooga Sheet, Tennessee ; Sacramento Sheet, California ; Kingston Sheet, Tennessee ; Lassen Peak Sheet, California ; and the Hawley Sheet, Massachusetts. Each fasciculus consists of an index map on the scale of 50 miles to an inch and two folio pages devoted to a general explanation of the signs, lettering, colours, etc, employed on the accompanying map and sections. This is followed by a general account of the geological history of the district specially under notice, and then by a concise account of the more important stratigraphical details, of the structure of the country, and of its chief mineral resources. Next comes a clearly printed topographical map, on the scale 1 : 125,000, with contour lines at every hundred feet printed in brown, and with the water-courses in blue. Then follow three sheets of the same district—the first colour printed to show the areal geology, the next the economic geology, the third the structural geology—each map being accompanied by one or more transverse sections, which are engraved on the map along the zone of country whose geological structure they are intended to illustrate. Finally, a sheet of columnar sections is given which show the relative position and thickness of each formation represented, and give a graphic representation of the general lithological character of the various subdivisions of the strata, their variations in thickness in different areas, their special economic importance, and the general character of the topography to which they give rise.

Nearly all the publications issued by the American Government have long been celebrated for their general excellence, and especially for the prominence given to the economic aspect of geology. As regards the Atlas now before us, it is perhaps hardly too much to say that it would be difficult to suggest any improvement.

ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

REPORT OF COUNCIL.

Ninth Session, 1892-93.

The Council has the honour to submit the following Annual Report on the Session.

Membership.

The gains and losses in the number of Members have been as follows :—

Number on 31st October 1892,			1475
New Members elected,		80	
Deduct by deaths,	26		
„ resignations,	93		
„ removed from the Roll (subscriptions in arrear),	19		
	—	138	
Net decrease during the Session,			58
Number remaining on 31st October 1893,			1417

Diplomas of Fellowship.

The Council, acting on the recommendation of the Education Committee, has conferred the Honorary Diploma of Fellowship on the following gentlemen, viz. :—Captain F. D. Lugard, D.S.O.; James Jackson, Librarian of the Paris Geographical Society; and General Lord Roberts, V.C.

Ordinary Diplomas of Fellowship were also conferred on the seven gentlemen whose names follow, viz. :—Colonel T. Cadell, V.C.; James Frame; W. Gloag Galletly; T. Thornton Macklin, M.B.; T. Ruddiman Johnston, F.R.G.S.; Colonel J. Matheson (retired), 1st L.A.V.; the Rev. J. Fairley Daly, M.A., B.D.

A Certificate of Thanks was awarded by the Council to M. le Savoureux, French Consul, for the service he had rendered to the Society by giving a lecture on Madagascar.

Finance.

The Council submits the subjoined Financial Statement :—

ABSTRACT OF THE ACCOUNTS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY

From 31st October 1892 to 31st October 1893.

FUNDS AT CLOSE OF LAST ACCOUNT :—			
£1000 Glasgow and South-Western Railway 4 per cent. Funded Debt, cost, 29th May 1885,		£1102 19 9	
£400 North British Railway 4 per cent. Consolidated Lien Stock, cost, 30th December 1890,		496 2 0	
		£1599 1 9	
Cash in Bank of Scotland, Edinburgh, in Account Current,	£82 11 7		
Add : Due by Secretary, £6 10 10			
Do. Hon. Treasurer, 3 2 0			
	9 12 10		
		92 4 5	
		£1691 6 2	
ENTRANCE FEES, 84 at £1, 1s.,	88 4 0		
ORDINARY SUBSCRIPTIONS :—			
11 Life Members at £10, 10s.,	115 10 0		
2 Annual Subscriptions of £1, 1s. for year 1888-89, £2 2 0			
4 Do. Do. 1889-90, 4 4 0			
14 Do. Do. 1890-91, 14 14 0			
61 Do. Do. 1891-92, 64 1 0			
1170 Do. Do. 1892-93, 1228 10 0			
36 Do. Do. 1893-94, 37 16 0			
1 Do. Do. 1894-95, 1 1 0			
	1352 8 0		
FEES received for Society's Diploma, 7 at £1, 1s.,	7 7 0		
SUMS received under the Society's Scheme for the encouragement of Geographical Education,	15 15 0		
PROCEEDS OF MAGAZINES sold,	61 5 0		
DIVIDENDS and BANK INTEREST,	63 11 0		
GRANT from BRITISH ASSOCIATION towards expenses of Place-Names Committee,	7 0 0		
LECTURE TICKETS sold,	8 0 3		
		1719 0 3	
		£3410 6 5	

MAGAZINES, Printing, Paper, Lithographing, etc., from Nos. 9 to 12 of Vol. VIII., and Nos. 1 to 8 of Vol. IX., all inclusive, and for Postage, etc.,		£658 4 4	
Less : Received during the year for Advertising,		60 0 0	
		£598 4 4	
GENERAL PRINTING,		42 18 2	
BOOKS and other Furnishings for Library, £42, 12s. 6d., less received for Duplicates sold, £9, 19s.,		32 13 6	
RENTS OF HALLS, and other expenses of Lectures,		121 16 3	
RENTS OF COUNCIL ROOM, Taxes and Gas, Repairs, Insurance, etc.,		129 17 11	
SALARIES :—			
To *Secretary*, year to 15th October 1893. £200 0 0			
,, *Librarian and Clerks*, 212 19 0			
		412 19 0	
EXPENSES connected with Society's Education Scheme,		31 19 6	
MEDAL FUND,		4 3 6	
MISCELLANEOUS, including Stationery, General Expenses, Advertising, Cleaning, Bank Charges, Postages, and Office Furniture, £111, 9s. 3d., less balance received from London Branch, £9, 1s. 9d.,		102 7 6	
		£1176 19 8	
FUNDS AT CLOSE OF THIS ACCOUNT :			
£1000 Glasgow and South-Western Railway 4 per cent. Funded Debt, cost, 29th May 1885,	£1102 19 9		
£400 North British Railway 4 per cent. Consolidated Lien Stock, cost, 30th Dec. 1890,	496 2 0		
	£1599 1 9		
Cash in Accounts Current with Bank of Scotland at Edinburgh, £313, 13s. 8d., and at Glasgow, £7, 14s.,	321 7 8		
Due by Secretary, £11, 0s. 4d., and by Honorary Treasurer, £1, 17s.,	12 17 4		
		1933 6 9	
		£3410 6 5	

Edinburgh, 10th November 1893.—I have examined the Accounts of the Royal Scottish Geographical Society, for the year ending 31st October 1893, of which the above is an Abstract, and compared them with the Vouchers and Instructions thereof, and find the same correct and sufficiently vouched.

HUGH BLAIR, C.A.

The Statement shows that during the past year the Society's funds have increased by £242, 0s. 7d.

The Council desires to express its acknowledgments to Mr. Hugh Blair, C.A., the Honorary Auditor, who has again examined and passed the accounts of the Society.

Meetings.

Nineteen meetings were held during the Session. Of these 9 were in Edinburgh, 5 in Glasgow, 2 in Dundee, and 3 in Aberdeen. Lectures were delivered at these meetings by Mrs. Grove ; Lieut. Buist; Captain Dundas, R.N.; Professor James Geikie ; Captain Lugard ; M. Rankin ; Colonel Justin Ross ; M. le Savoureux ; Mr. Selous ; Dr. James Stewart.

Education.

The Education Committee organised two Courses of Lectures last winter. Mr. J. G. Goodchild, F.G.S., delivered a Course of six Lectures on Volcanoes, which were well attended and popular, the number of tickets taken out and paid for being 51.

This was followed by a Course of six Lectures on the Geographical Distribution of Animals, by Mr. J. Arthur Thomson, M.A., which, owing perhaps to the nature of the subject, did not attract so large a number of students, but which were not less highly appreciated by those who heard them. The number of tickets taken out for Mr. Arthur Thomson's Lectures was 31.

The Committee also arranged for two Christmas Lectures for the special benefit of young persons. Professor Cargill G. Knott gave a very interesting lecture on "Life in Japan ;" and Mr. J. Graham Kerr described, in a manner no less attractive, "A Voyage to South America, and Experiences in Argentina." Both Lectures were illustrated with lantern views, and their success was such as to encourage the Committee to repeat the experiment this winter.

The Committee has arranged for two Courses of Lectures for the ensuing Winter Session :—

Mr. W. B. Blaikie has agreed to give a Course of four Lectures on "Teaching the First Principles of Geography and Map-making," and Mr. W. L. Carrie, M.A., will give a Course of six Lectures on "Historical Geography."

The above lectures will, in the opinion of the Committee, prove specially interesting to teachers,—the class of the community which these lectures are primarily intended to attract and influence.

The Society's Magazine.

In consequence of the indisposition of the Secretary, the duties of acting Editor of the Magazine were assumed by Mr. W. A. Taylor for six months from the 1st April. This arrangement has been found to work to the satisfaction of the Council, and Mr. Taylor has been confirmed as Editor.

The Council takes this opportunity of publicly thanking the authors of signed articles, as well as the undermentioned gentlemen, who, amongst others, have rendered valuable assistance to the Editors :—

Hon. J. Abercromby ; J. T. Bealby ; W. B. Blaikie ; Fr. Bosse ; Dr. Burgess ; Dr. Dalgleish ; Colonel Dods ; Dr. Dods ; Dr. Felkin ; J. Geddie ; Prof. Geikie ; J. G. Goodchild ; John Gunn ; D. P. Heatley ; A. J. Herbertson ; Prof. Knott ; J. W. M'Crindle ; D. Patrick ; R. Richardson ; Charles Robertson ; Dr. Geo. Smith ; J. Arthur Thomson ; Coutts Trotter ; Prof. Wallace ; A. Silva White.

Library and Map Department.

During the past Session 674 books and pamphlets, 329 map-sheets, and 27 atlases have been added to the Library and Map-Room. The number of books borrowed by members has been 2018, an increase of 515 over the figures of last year. The number of periodicals received in exchange for the Society's Magazine is now 120. Foreign and Colonial Governments continue to present official publications to the Library, and private donors have contributed valuable additions to the stock of books.

The public visit the Library and Map-Room to a large and increasing extent, in order to obtain information and advice on Geographical subjects.

The expenditure has been £42, 18s. 6d., out of which sum all necessary binding has been paid for.

Place-Names Committee.

Work was continued throughout the Session, about 970 place-names in the parish of Kilchoman, about 940 in Kilarow and Kilmeny, and over 1200 in Kildalton and Oa—all in Islay—having been disposed of. The list for Jura has not yet been returned by the Local Committee; other lists are in course of preparation. The result of the Examination of over 3100 names in Islay has been the revision of about 520, or 16 per cent. of them, the proportion varying from about 11 per cent. in Kilarow to nearly double that percentage in Kildalton.

The Committee have also considered the spelling of certain other place-names, referred to them from time to time by the officers of the Ordnance Survey.

The Committee has formulated the principles which should guide its decisions; and these, with other matters, are under discussion with Sir Charles Wilson, who attended a recent Committee Meeting for the purpose. Instructions have also been ssued for the guidance of the Local Committees.

In 1892 the British Association granted a sum of £7 in aid of this work; but the grant has not been renewed, and the want of clerical assistance will be much felt unless some aid can be afforded by the Director of the Ordnance Survey.

Corresponding Societies.

The Royal Geographical Society (London) has conferred on this Society the privileges of a Corresponding Society: and similar privileges have been offered to and accepted by, the London Society.

Colonial and Foreign Visitors.

A Resolution of Council has been passed inviting gentlemen from the Colonies and foreigners, who may visit Edinburgh, to make use of the Society's Rooms and to attend their ordinary Meetings.

The Society's Branches.

The Council desires to express its acknowledgments to the Conveners, Secretaries, Honorary Treasurers, and members of the Committees in Glasgow, Dundee and Aberdeen, for the efficient control they have exercised over the Society's Branches in those cities.

65
70
75
80
85
35
30
25
20
AFGHANISTAN
BALUCHISTAN
SIND
PUNJAB
KASHMIR
RAJPUTANA
ROHILKHAND
OUDH
BUNDELKHAND
MALWA
GUJARAT
BERAR
BEHAR
BENG
NIZAMS DOMINIONS
ARABIA
Kabul
Peshawar
Ghazni
Kandahar
Quetta
Khelat
Lahore
Amritsar
Bahawalpur
Delhi
Meerut
Moradabad
Bareilly
Shahjahanpur
Agra
Bikaner
Jodpur
Ajmere
Cawnpur
Lucknow
Gorakpur
Haidarabad
Karachi
Pali
Allahabad
Benares
Patna
Mirzapur
Ahmadabad
Dhar
Indore
Jabalpur
Baroda
Surat
Bombay
Amraoti
Nagpur
Aurangabad
Ahmednagar
Cuttack
Chicacole
Bhutan
Tibet
Kaumaon
Hindu Kush
Indus
Sutlej
Ganges
Narbada
Godavery
Mahanadi
Gulf of Cutch
Gulf of Cambay
Runn of Cutch
Hurdwar
Agra Canal
Jumna
Chumbul
Bundelkhand
Rajpootana
Malwa
Berar
Gwalior
Rewah
Sumbulpur
Jagannath
Chilka L.
Ganjam

MAPS ILLUSTRATING LORD ROBERTS' ADDRESS ON 'INDIA, PAST AND PRESENT'

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